

PRE-BID CLARIFICATION

**Clarifications to the queries received against our tender notice of “High-Temperature Vacuum Furnace with High-pressure Gas quenching System”
having tender notice no. no. IPR/TN/PUR/TPT/ET/20-21/12 dated 18.01.2021**

Sr. No.	Technical specifications	Clause heading	IPR’s Specifications	Clarification asked by vendors	Clarification from IPR
1	Page No.- 3	Scope of work	Any additions or revisions in the scope of work due to revision in the requirement of functions, designing and interface with other system; also form the part of the scope of work mentioned herein	Explain the details of what will be the additions or revisions.	Minor revisions required at the time of manufacturing are considered in it and its financial implication will not be more than 1% of the total cost.
2	Page No.- 3	Scope of work	We will provide the required power on the wall mounted DB which is around 25 meter away from the lab, so necessary cables need to be provided by the vendor.	The DB around 25 meter away from the lab, Can be made of battery limit of 5 meters with the building	DB is in the same building or lab but 25 meter far from the location of the system. Vendor has to provide the input cable having sufficient capacity and length.
3	Page No.- 4	Detail technical write up of the system	Conductance valve must have variable openings which will be useful to reduce the gas consumption during process.	Function conductance valve is it throttle valve to maintain set partial pressure.	Vendors can provide pneumatic /motorised throttling valve with controller with selectable opening from 10 to 100%. As per technical specification no. 1.8.2.
4	Page No.- 7		Opening of the conductance valve can be increased/decreased as per the requirement and also speed of the vacuum pump can be varied as well.		
5	1.2.4	Operating Quenching Internal pressure	10 +1 bar (abs).	Please clarify	System should be designed for 16 bar pressure and expected operating quenching pressure could be up to 11 bar (abs).
6	1.2.5	Design Internal pressure	16 bar (abs).		The design internal pressure should be 16 bar (abs) of the high temperature vacuum furnace.

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7	5.3.3	Volume	The gas storage system of suitable volume and pressure to transfer 16 bar (abs) into the chamber for nitrogen gas quenching.	Normally design pressure will be 10-15% more than operating pressure say 11.5 bar. Pl clarify.	Vendor has to design the nitrogen chamber such that it can fill entire vacuum furnace with nitrogen gas up to expected operating quenching pressure of 11 bar (abs).
8	1.8.2	Different opening positions of conductance control valve	25%, 50%, 75% and 100% opening. Default value shall be 100% opening while evacuating the vacuum furnace.	We feel 25%, 50%, 75% and 100% opening of the conductance valve maintaining 1-10mbar pressure cannot be achieved. We propose online PID closed loop throttle valve or proportional valve operating with respect to this set pressure (say 1 to10 mbar) by using pressure transmitter.	Vendors can provide pneumatic /motorised throttling valve.
9	2.1	Ultimate vacuum pressure	Better than 5×10^{-2} mbar with charge of 500 kg.	Please confirm is it Ultimate vacuum or working vacuum. Normally Ultimate vacuum will be carried out, under certain conditions that are cold, clean, empty, degassing chamber, back filled with dry nitrogen.	Here ultimate pressure should be considered as base pressure (5×10^{-2} mbar) in the vacuum furnace with 500 kg charge to be processed.
10	2.2	Type of pump	Combination of rotary piston and booster pump. Mechanical booster pump with sufficient displacement capacity and proper compression ratio with rotary piston pump displacement shall be provided.	Can rotary vane pump be used with booster pump?	Rotary vane/piston pump should be supplied in combination with booster pump and this combination should be capable to achieve the specified base pressure (5×10^{-2} mbar) in 20 min with the 500 kg charge.
11	Page no 4	Variable pumping speed	Both the pumps shall operate at variable speeds.	Is it required as the Conductance valve is available?	Yes, variable pumping (VFD) speed also required.
12	2.3	Variable pumping speed	Pumping speed shall be variable.		
13	3.1	Capacitance Mano-meter	A capacitance mano-meter gauge shall be provided The gauge selection shall be on following	Is Capacitance Manometer gauge required, normally partial pressure will be measured	Capacitance manometer gauge is required.

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		gauge	criteria. I. Pressure range: 1 x 10 ⁻² mbar to 100 mbar. II. Temperature: ~50°C. Resolution: ~0.003% of full scale.	by same pressure transmitter.	
14	4.1.1	Configuration of actual hot zone	Cylindrical and horizontal	Cylindrical or it can be multi sided polygon.	Hot zone configuration can be cylindrical or multisided polygon and horizontal.
15	4.3.5	Material for covering of radiation shielding	Shielding shall be covered with carbon-carbon composite long fibre to reduce the erosion rate of the shielding material at high velocity of quenching gas.	We propose to use CFC faced graphite boards or we should only provide shields covered with carbon-carbon composite long fibre separately if so please specify thickness.	CFC faced graphite boards can be provided.
16	4.4.3	Element distribution	Uniform over entire length and diameter of hot zone, on front dish end and on radiation shield between hot zone and heat exchanger of vacuum furnace.	Are the heating elements required all six sides of hot zone, normally heaters will be provided on cylindrical side to meet the requirement of Pt.No.- 4.1.9 temperature uniformity of ± 6°C for class II furnace.	Heating elements are required on cylindrical (multisided polygon) and on rear and front side as well as per the requirement of AMS pyrometry class E.
17	4.4.4	No. of heating zones	Entire hot zone shall be divided in multiple heating zones.	Please confirm the No. of hot zone as the zone wise control circuitry cost will be High difference.	Entire hot zone shall be divided in three heating zones along the cylinder axis (multisided polygon).
18	Page no 5	The hearth plate shall be electrically isolated with these supports and also from other parts of the hot zone. It shall be apart by ~ 70 mm from all the side	Hearth plate must be provided. The size of the hearth plate shall be defined in such a way so that nearest edge of the hearth plate shall be apart about 70 mm from all sides from the heater.	Please explain approximately 70mm from all side.	Kindly see the drawing of job loading area

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19	4.6.1	Size			
20	5.1.2 & 5.1.3	Material of Finns & Material of Tubes	Aluminum & Copper	Can we use other material like SS & copper Finns for longer life as copper tube life will be reduced due to phenomena of work hardening.	Yes, vendors can use SS for body and copper for fins.
			quenching (pressure between 3 to 10 bars) with maximum quenching rate 40°C/min.	Is the cooling rate to be less than 40°C/min, as 10 bar higher quenching rate got.	This rate of quenching should be variable and having a max. value 40°C/min and minimum 5°C/min.
21	6.2	Data logging & Plots	l) Quenching rate	Quenching rate means?	Quenching rate plot means time vs temperature.
22	7.6	UPS	UPS with sufficient power back up capacity shall be supplied for entire water cooling system devices like, electric motors for water circulation, cooling tower data acquisitions system, vacuum pumps, all the valves etc.	Normally UPS will be only preferred for the control panel instrument for 20 – 30 mins. The water cooling system an over head tank with gravity flow in addition can have generator / diesel water pumps along with electrical water pumps.	UPS will be required for the control panel/Data acquisition system only.
23	Page no 22 heading 5 pt no d	Interlocks:	In the case of mains power failure, data acquisition system and cooling system must be powered by UPS immediately.		
24	Page no 23 Note to the Manufacturer pt no F	Note to the Manufacturer	The manufacturer shall submit completed questionnaire as per Annexure-A along with the offer.	PI clarify	Vendor has to submit the questionnaire as attached with the tender document.
25	Page no 23 Note to the Manufacture	Note to the Manufacturer	Manufacturer shall have to submit design calculation for double walled chamber thickness, heater power calculations, thermal radiation shield, hearth plate and its supporting structure, heat exchanger and blower design, chamber stand and nitrogen gas chamber design, rear and front dish end and take approval from IPR before fabrication.	PI clarify if all the design calculations are required	Yes, vendor has to submit all the design calculations with thermal and structural analysis to meet the functional requirement for approval before the start of manufacturing drawings.
26	page no. 3 of 30	Scope Of Wok:	The vacuum furnace should have	vendor presumes gas exchanger as heat	Yes, please read it as heat

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		Detail technical write up of system:	several ports for heater electrodes gas exchanger, thermocouples, etc.	exchanger? Please confirm	exchanger.
27	page no. 5	Scope Of Wok: Detail technical write up of system	The blower fan motor must be placed behind the heat exchanger.	As per tender point no. 2.3, a bypass line between the Vacuum furnace and the blower fan motor hood along with an electro pneumatically operated butterfly valve shall be provided. What does this bypass line means? Is it for evacuation of motor hood, if so please note motor assembly inline to vacuum furnace chamber is evacuated at the same time without any isolation. Therefore as per our design no bypass valve is required for evacuating motor assembly.	Bypass line as specified is required as per IPR's specification.
28	page no. 7	2. Introduction:	The High Temperature Vacuum Furnace with High Pressure Gas Quenching system is meant for diffusion heat treatment process of steels & their alloys under vacuum and high pressure for enhancing the life of the component.	Vendor will be responsible only for the functional parameters of the furnace as per the technical specifications. However, vendor assumes process technology related to heat treatment and carburizing is available with IPR.	Yes, Vendor is responsible for technical parameters as mentioned in the tender documents. However high temperature, vacuum and high pressure gas quenching performance is the responsibility of the vendor.
29.	page no. 8	3.2. Design Basis	Working volume: Diameter: 1000 ±50 mm. Depth: 1200 ±50 mm.	Vender's standard 9x9x12, 10bar furnace has an effective hot zone diagonal of 1272mm Ø and 1200mm Depth. Can we offer the same standard furnace?	No, Vendor has to design the furnace as per the IPR's technical specifications.
31	Page no. 16	4.6. Hearth Plate:		As per our design the hearth support will be consisting of longitudinal graphite beams and rods to hold the job weight. Please note customer shall	The hearth plate should be thermally and electrically isolated from the load bearing support structure which is integrated to the chamber. The

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				place the job with fixture on the hearth support. If customer requires Moly/Graphite grid then the same can be provided.	hearth plate can be made high temperature material graphite/CFC.
32	Page no. 18	6.5. MIMIC DRAWING & FLOW CHART:		We will provide a 10'' HMI with touch screen for displaying the MIMIC drawing of the system on panel instead of MIMIC drawing with indication lamps on panel.	<ol style="list-style-type: none"> 1) Industrial grade computer with 19''TFT touch screen monitor should be supplied as per the defined specifications. 2) The specification requirement should be achieved using supplied SCADA software which will run on industrial grade computer.

schematic view of hot zone

