



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

An ISO 9001
Company

ENQUIRY NOTICE INVITING TENDER	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com
-----------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

TWO PART BID	Enquiry Number: 2711300002	Enquiry Date: 08.01.2013	Due date for submission of quotation: 09.02.2013
---------------------	--------------------------------------	------------------------------------	-------------------------------------------------------------------

You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order.
Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

S.No	Description	Quantity
1	7.5 Ton Reheating Furnace as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	01 No.

IMPORTANT POINTS TO BE TAKEN CARE DURING SUBMISSION OF OFFER FAILING WHICH THE OFFER WILL NOT BE CONSIDERED FOR EVALUATION.

- 1. CHECKLIST FOR COMMERCIAL TERMS ACCEPTANCE TO BE FILLED AND ENCLOSED ALONG WITH THE OFFER.**
- 2. THE CAPACITY/SUPPLY DETAILS AS REQUIRED IN CLAUSE 17.0 OF THE CHECKLIST FOR COMMERCIAL TERMS ACCEPTANCE IS TO BE ENCLOSED**
- 3. IN LINE WITH THE MANDATORY REQUIREMENT OF GOVERNMENT OF INDIA, THE INTEGRITY PACT IS TO BE EXECUTED BY BHEL AND ITS SUPPLIERS. HENCE WE ARE ENCLOSING THE SCANNED COPY OF INTEGRITY PACT. WE REQUEST YOU TO KINDLY DOWNLOAD THE ATTACHED INTEGRITY PACT AND AFFIX YOUR SIGNATURE AND SEAL IN ALL THE PAGES. IN THE PAGE NO. 8 OF 8, IN ADDITION TO YOUR SIGNATURE AND SEAL PLEASE GET THE WITNESS SIGNATURE AND SEAL. THE WITNESS SIGNATURE FROM ANY ONE OF YOUR ORGANISATION. DULY FILLED INTEGRITY PACT SHALL BE SUBMITTED ALONG WITH THE TENDER.**
- 4. THE TENDER WILL BE MONITORED BY IEM – Shri J M Lyngdoh , IAS (Retd.)**
- 5. THE EMD FOR THIS TENDER WILL BE (INR) : 2,00,000.00**
- 6. DELIVERY REQUIRED 8 MONTHS FROM THE DATE OF PURCHASE ORDER.**

All updates, amendments, corrigenda etc (if any) will be posted only on the above websites from time to time, as and when required, until tender is opened. There will be no publication of such updates, amendments corrigenda etc. Through newspapers or any other media.

BHEL commercial terms & conditions with Price Bid and Bank Guarantee formats can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units) Bharat Heavy Electricals Limited page) under Enquiry reference above .

Tenders should reach us before 14:00 hours on the due date. Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For BHARAT HEAVY ELECTRICALS LIMITED Engineer / MM / Capital Equipment
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 1 of 1

PART A - QUALIFYING CRITERIA**DT. 26 / 12 / 2012****ITEM DESCRIPTION: DESIGN, MANUFACTURE, SUPPLY, ERECTION AND COMMISSIONING OF 7.5 TONS/Hr CONTINUOUS DISCHARGEROLLER HEARTH HEAT TREATMENT FURNACE (NORMALISING& TEMPERING OPERATION)ALONG WITH ALL ACCESSORIES.**

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer.

The BIDDER / VENDOR have to necessarily provide the following details, for making an assessment of the firm's capability and competency:

[The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary.

An additional sheet may be attached (giving clear reference number) to cover the required details]

S.No	Requirements	Vendor's response
1.1	BHEL is looking for continuous discharge roller hearth heat treatment furnace of 7.5 Ton/Hr capacity capable of heating the metal to a temperature of 1100°C. Vendors who have minimum 5 years' experience in this manufacturing field shall be considered for this tender. Only those vendors who have supplied and commissioned minimum 2nos of similar type of furnace with total supply, erection and commissioning in the past ten years and such furnace should be working satisfactorily for a minimum period of 3years after commissioning as on the date of opening of this Tender are eligible to participate in this tender and quote.	
1.2	Proof of performance of the offered equipment shall be provided in the offer based on similar furnaces supplied to other customers by way of CERTIFICATION OF PERFORMANCE FROM ATLEAST ONE CUSTOMER. The Certificate shall indicate the Order no., Date of installation, Model No. and the performance status for the last two years.	
1.3	Details of Design Set-Up and Technology Back-Up assured from the PRINCIPAL Equipment Maker. Details on International Standards followed in Design of the Equipment.	
1.4	Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed)	
1.5	Indicate the number of continuous discharge roller hearth heat treatment furnace sold in India & Other Countries. Reference List of Customers with full details of the customer's CONTACT PERSON for cross reference by BHEL shall be provided. Details of such furnace supplied to other BHEL units, if any. (Year of commissioning, Inlet /outlet table size, tube surface quality, Combustion blower / exhaust system and fuel efficiency are to be furnished.)	
S.No	Requirements	Vendor's response

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 2 of 2

1.6	Parameters of furnace supplied, viz. loading system size, heating system size, heating system with type of fuel and burners including temperature control system. Performance trial taken and achievement of assured values like kg/ton, scale free output tubes from furnace and performance of safety control measure are to be furnished.	
1.7	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, their offer shall be rejected even though it is technically found to be suitable.	
1.8	The BIDDER / VENDOR shall submit the offer in TWO PARTS – “Part I - Technical and commercial bid”, and “Part II - Price bid”. The Technical Offer – Part I, shall be in line with the BHEL Technical Specifications and the Guidelines or Annexure mentioned, wherever applicable. This shall also include commercial conditions, list of spares and consumables for 5 years of trouble free operation, List of optional items and price list of all the items with the price blanked.	
1.9	Details on SERVICE-AFTER-SALES Set-Up in India including the Address of Agents / Service Centers in South India.	
1.10	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	
1.11	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A just ‘CONFIRMED’ or ‘COMPLIES’ or ‘YES’ or ‘NO-DEVIATION’ or similar words in the technical comparative statement may lead to disqualification of the Technical Offer. Where specification requirements are not met, the reason for this shall also be indicated point wise. Pl. confirm here.	
1.12	The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
1.13	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of ‘Bought-Out-Items’ with copies of Product Catalogue and Selection Criteria	
1.14	The points confirmed by the supplier based on the clarifications sought for the original offer shall be incorporated in the revised offer wherever applicable. Pl. confirm	
1.15	The bidder/Vendor shall provide a complete list of out sourced electrical, electronic and mechanical components with Source name, Specification and drawings	

PART B TECHNICAL SPECIFICATIONS / REQUIREMENTS (ANNEXURE – 2 TO INDENT NO:

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 3 of 3

S.No	Description of Requirement	Vendor's Response
2.1	Equipment: Continuous Discharge Roller Hearth Furnace suitable for normalizing and tempering.	
2.2	Materials to be Heat treated: Carbon steel and high alloy steel grade tubes. (upto 13% Cr content).	
2.3	Tube dimensions: Outer diameter: 19 mm to 133 mm. Wall thickness: 2.0 to 14 mm. Length: 23.0 m. long [maximum]	
2.4	Furnace capacity: Maximum 7500 kg/hour	
2.5	Line speed : 4 to 100 metres/hour	
2.6	Type of fuel: LPG / CNG (Offered burner should be compatible for both fuel. Suitability of burners should be mentioned)	
2.7	Protective gas : Nitrogen	
2.8	Cooling water Inlet temperature: 30 ° C max.	
2.9	Electric power supply : 3 Phase 415 volts \pm 10%, 50 Hz \pm 5%	
2.10	Burners: Single ended radiant tube burners. Make: LBE – Germany / ESA PYRONICS / ECLIPSE. Vendor to specify.	
2.11	No. of temperature control zones - Vendor to specify	
2.12	No. of radiant heating tube burners/Zone – Vendor to specify	
2.13	Mounting of radiant tube – Vendor to specify	
2.14	Operating temperature : 700 to 1100 deg C	
2.15	Maximum furnace temperature : 1150deg. C	
2.16	Thermocouples : `K' type	
2.17	Rollers are to be designed to take care of the Maximum load on the roller hearth with load uniformly distributed on the hearth at operating temperature.	
2.18	Discharge temperature of the tubes at 1100°C operating temperature at the discharge roller table:< 150 ° C	
2.19	Connected heating load : Vendor to specify in Kcal	
2.20	L.P.G. flow rate: 100 Nm ³ / hour (max) at 1 bar (max) pressure before gas valve train. For CNG - vendor to specify the parameters.	
S.No	Description of Requirement	Vendor's Response
2.21	Energy Consumption data: 1) Specific fuel consumption at continuous (24X7) and full load output at 1100	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 4 of 4

	° C. 2) Electricity 3) Protective gas consumption. Vendor to specify	
2.22	Protective Gas: Nitrogen: (Nm ³ /Hr.), O ₂ : < 5 ppm. Dew point: minus 60 °C. Inlet pressure (mbar). Vendor has to indicate the optimum quantity required.	
2.23	Cooling water: 50 m ³ /hour soft water at ambient temp. Cooling water outlet temperature: 45° C(max)	
2.24	Skin temperature of Furnace casing: Near burner area: 100 – 120 ° C Other area of furnace: Max. 80 ° C	
2.25	Surface of the tube after heat treatment: The surface of the tube after heat treatment should be free from scale , soot, oxidation and further decarburization.	
2.26	Loading table: One Charging roller table at the inlet end is to be provided complete with M.S. steel structure, M.S. rollers, bearings with Plummer blocks, etc. All the rollers are to be driven by a common motor drive through chain sprocket arrangement. Also separate drive is to be provided for fast charging. The chains and sprockets are to be properly guarded to avoid accidents while loading. The table should have sufficient length to accommodate the maximum tube length.	
2.27	Inlet vestibule / Entry seal: One inlet vestibule is to be provided complete with fully welded gas tight M.S. casing, rollers, bearings with Plummer blocks, etc. The vestibules are to be partly lined towards the heating section. Three numbers special curtains are to be provided for sealing purpose and to avoid heat losses and 2 nos motorised operated door is to be provided at entry and exit side of the furnace to avoid the air ingress into the Furnace along with tubes.	
2.28	Dimensions: The offered furnace dimensions and structures should be suitable to process 23 meter length tubes for heat treatment. Drawing with bill of materials showing all the parts with dimensions of total furnace structure consisting of inlet, heating, soaking, cooling, outlet and tube collection trough arrangement should be enclosed by the vendor along with technical offer. Total length from inlet to outlet shall be restricted to 150 M.	
S.No	Description of Requirement	Vendor's Response
2.29	The rollers should have a tolerance of +/- 2 mm in O.D. Roller pitch and material: vendor to specify to meet the application and	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 5 of 5

	trouble free operation. Working level above floor level should be minimum 1050mm.	
2.30	Refractory lining inside the Furnace – Vendor to specify the type of refractory to be used and its life.	
2.31	<u>Furnace casing:</u>	
	2.31.1 The heating section should have a gas tight sturdy M.S. casing reinforced by strong steel sections.	
	2.31.2 Enclosure which is supporting the radiant tube with furnace walls is to be made from Stainless Steel only.	
	2.31.3 The furnace section is to be provided with centrifugally cast heat resistant alloy [HN grade] rollers complete with sealing plates, Plummer block bearing, heat resisting steel deflector plates(Preferably welded to the side wall), etc.	
	2.31.4 Necessary mounting flanges for radiant tubes, thermocouples, inlet for protective gas, sight glasses are to be provided.	
	2.31.5 The furnace should be lined from inside with refractory insulation bricks and ceramic fibre blankets.	
2.32	<u>Conveyor roller system:</u>	
	2.32.1 The rollers in each part of the Furnace are to be made suitable for continuous operation at a temperature of 1100°C. The rollers are to be mounted with gas tight bearings and special sealing arrangement.	
	2.32.2 The rollers can be extracted / removed from outside the Furnace to one side. The mountings are to be provided with efficient seal to prevent leakage and maintain normal operating pressure within the Furnace.	
	2.32.3 The rollers are to be fitted with sprockets for continuous chain drive.	
	2.32.4 The drive shall comprise a fan cooled AC motor and speed reduction gear box. The drive should be complete with all necessary guards and chain tensioners.	
S.No	Description of Requirement	Vendor's Response
	2.32.5 Provision is to be made for access for inspection and maintenance of bearing sprockets and chains.	
	2.32.6 The conveyor speed is to be chosen to give the optimum output from	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 6 of 6

	the Furnace over the entire range of tube sizes and treatment cycles.	
	2.32.7 The drive mechanism includes a tacho generator or an encoder suitable for providing the input signal to the P.L.C. system for recording the speed.	
	2.32.8 The speed of the main drive and the charge drive is to be controlled by means of a frequency converter [direct torque control drive].	
	2.32.9 The charge is to be conveyed through the Furnace by the above mentioned driven rollers at a uniform speed. Vendor should specify the means for roller extraction system.	
2.33	<u>Intermediate vestibule:</u>	
	2.33.1 One intermediate vestibule is to be provided between heating section and pre-cool chamber.	
	2.33.2 This shall be complete with fully welded gas tight M.S. casing, rollers, bearings with Plummer blocks, etc.	
	2.33.3 The intermediate vestibule shall be insulated with refractory on side walls, bottom and with ceramic fibre blankets on roof.	
	2.33.4 Manhole is to be provided on the roof of intermediate vestibule	
2.34	<u>Outlet vestibule:</u>	
	2.34.1 The end of the cooling section shall be sealed with an outlet vestibule made of gas tight welded steel structure.	
	2.34.2 This shall comprise of a roller bed [similar to the inlet vestibule]. Three special curtains along with 2 motorised operated doors are to be provided for minimising ingress of outside air into the Furnace.	
2.35	<u>Combustion system:</u>	
	2.35.1 Combustion system comprises of radiant tube burners and all necessary accessories. The combustion system shall be of reputed makes like LBE – Germany / ESA Pyronics / Eclipse.	

S.No	Description of Requirement	Vendor's Response
------	----------------------------	-------------------

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 7 of 7

	<p>2.35.2 Microprocessor based Temperature control system for pulse firing. Inner tube made from silicon carbide/ SiSiC(Siliconized Silicon Carbide).Outerradiant tube assemblies made from silicon carbide.Ignition transformers and flame sequence controllers. Solenoid valves for combustion air and gas. Fuel adjusters, manual valves for air / gas. Orifice meter plates for air and gas</p>	
	<p>2.35.3 The Furnace is to be heated by number of gas fired radiant tubes. They are to be arranged such that uniform heat transfer shall be ensured. The burners will be controlled in ON/OFF mode. All the radiant tubes should be identical in all aspects. The radiant tube assembly should be plug-in type. For maintenance, it would be possible to remove and reinsert the radiant tube assembly without any major dismantling of Furnace.</p>	
	<p>2.35.4 As mentioned above, the burners should have in-built recuperator to increase the thermal efficiency. The flue gases discharged from the radiant tubes shall pass into the flue exhaust pipes fitted above the Furnace. These pipes should be connected to a common header which is to be connected to a chimney</p>	
	<p>2.35.5 The main header of LPG / CNG supply will have gas valve train assembly comprising:</p> <ul style="list-style-type: none">2 Nos. Manual isolating valves, 1 No. Gas filter1 No. Gas solenoid valve, 1 No. Safety shut-off valve1 No. Pressure relief valve1 No. Pressure regulator1 No. Gas pressure switch, High/Low2 Nos. Pressure gauges <p>However, the quantity may be concluded after technical discussion.</p>	
2.36	<p><u>Cooling chamber:</u></p> <p>2.36.1 Cooling chamber shall have two chambers viz. primary and secondary. Primary cooling chamber shall have M.S. gas tight casing, complete with centrifugally cast rollers for initial 10 m. length and M.S. rollers for the balance length of the cooling chamber, sealing plates, Plummer block bearings, etc.</p>	
S.No	Description of Requirement	Vendor's Response

Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP

Page 8 of 8

	<p>2.36.2 In primary cooling zone 1st compartment alone, apart from the manhole, top tray should have provision to be removed for easy maintenance. In Primary cooling zone inner wall, guide plate and support beam are to be made from Stainless Steel to withstand thermal shock.</p>	
	<p>2.36.3 The side wall, bottom and roof are to be lined with ceramic fibre of 100 mm thickness. In pre cool chamber. SS-316 grade tubes are to be provided above and below the rollers through which cold water shall be circulated to cool the charge. These cooling tubes are to be in a plug type bundle assembly which shall be mounted in such a way that it can be easily removed for examination, testing and repair [like the radiant tube] without having to dismantle the entire cooling chamber.</p>	
	<p>2.36.4 The cooling chamber is to be provided between the exit of intermediate vestibule and the inlet of water jacket cooling section. The chamber should have the following features / advantages:</p> <ul style="list-style-type: none"> ▪ Shall reduce the heat from reaching the water jacket and thus reducing thermal shock. 	
	<p>2.36.5 The flow of water shall be absolutely streamlined and uniform and hence, no possibility of steam pocket unlike in case of water jacket to pre-cool chamber. The tube bundle can be easily removed and pressure tested at high pressure.</p>	
2.37	<p><u>Unloading table:</u></p> <p>2.37.1 One Discharge roller table at exit is to be provided complete with M.S. steel structure, M.S. rollers, and bearings with Plummer blocks.</p>	
	<p>2.37.2 All the rollers are to be driven by a common motor drive through chain sprocket arrangement.</p>	
	<p>2.37.3 Also separate drive is to be provided for fast discharging.</p>	
	<p>2.37.4 The chains and sprockets shall be properly guarded to avoid accidents while unloading.</p>	
S.No	Description of Requirement	Vendor's Response
	<p>2.37.5 The table shall have sufficient length to accommodate the maximum tube length. Pneumatically operated discharge table angle should be</p>	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 9 of 9

	suitably designed to ensure easy falling of tubes.	
2.38	PLC – PC Based Instrumentation and Control System Temperature Uniformity: +/- 10°C Temp. Measurement Tolerance: +/- 5 °C Type Of Temperature Control : Ratio Control The instrumentation system should provide the following control loops <ul style="list-style-type: none">▪ Furnace temperature control▪ Furnace over-temperature control▪ Burner auto ignition and flame monitoring▪ Recuperator protection loop▪ Pre-heated combustion air over-temperature control loop▪ Furnace pressure monitoring/control loop▪ Combustion air pressure control loop It should include the following features. 2.38.1 The soft PID control loops should be implemented with the PLC. The scanning cycle time should be less than 100 milli seconds	
	2.38.2 Direct contact of PLC-Field instruments should be avoided with necessary isolation techniques.	
	2.38.3 The entire furnace operating parameters should able to view/control with the user-friendly PC & SCADA	
	2.38.4 The PLC-PC based instrumentation should include SCADA monitoring and supply of operating software package and necessary hardware.	
	2.38.5 It should be provided with data logging and printing facilities and capable of producing shift/daily/monthly reports as required by us.	
	2.38.6 The over view of furnace and its set parameters and temperatures Vs. time program profile generation should be provided.	

S.No	Description of Requirement	Vendor's Response
------	----------------------------	-------------------



Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP

<p>2.38.7 The following reports should be available</p> <ul style="list-style-type: none"> i. Zonal temperatures vs. time. ii. Fuel consumption vs. time, weight processed iii. Air flow vs. time, iv. Furnace pressure vs. time, flow of protective gas v. Combustion air pressure vs. time vi. Shift/daily/monthly fuel consumption of weight processed vii. O₂, CO vs. time if necessary. 				
<p>2.38.8 The time intervals of report generation should be selectable/adjustable by the operators.</p>				
<p>2.38.9 UV flame monitoring system should be included with safety features to cut of fuel supply during burner flame failure along with continuous monitoring of Furnace flame.</p>				
<p>2.38.10 Self-diagnostic features should be available and it should include fault annunciation page, alarm logging and simulation tests.</p>				
<p>2.38.11 Any addition/Modification in the control parameters and software shall be able to carry out by Maintenance personnel. The Instrumentation System shall consist of the following instruments.</p>				
S.No	INSTRUMENT	DESCRIPTION	PREFERRED MAKE	
1	Thermo couples with compensating cables	'K' type – Duplex/simplex	Vendor to specify the make subject to BHEL approval	
2	LPG / Air Flow Indicator	With square root extractor & TEMP compensation	Yokogawa/ Honeywell	
3	Zonal control Valves for LPG line	With Pneumatic actuators	Fouress / Crescent /AVCON	
4	LPG Totalizer	To quantify LPG consumption	Yokogawa	
5	Orifice Plates	With relevant data sheets	Crescent / DEMLA	
S.No	Description of Requirement			Vendor's Response
S.No	INSTRUMENT	DESCRIPTION	PREFERRED MAKE	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 11 of 11

6	Butterfly valves	Combustion air control	Fouress / Crescent /AVCON	
7	Differential pressure transmitters	Explosion proof to measure air flow rate	Yokogawa / Fuji / Emerson	
8	Pressure Transmitter	Explosion proof to measure combustion air pressure	Yokogawa / Fuji / Emerson	
9	Pressure Transmitter	Explosion proof to measure furnace pressure	Yokogawa / Fuji / Emerson	
10	Flame scanners	With flame failure relay output to cut off LPG and continuous monitoring of burner flame	Vendor to specify the make subject to BHEL approval	
11	Auto ignition system	With constant interval ignition	Vendor to specify the make subject to BHEL approval	
12	On-line Gas analyzer	For O ₂ and CO measurement In flue gas outlet	Honeywell/ Yokogawa	
13	Microprocessor PID controller	With remote set point to control LPG flow	Yokogawa /Honeywell	
14	Current/Pressure Converters	For valve operation	Yokogawa/Honeywell	
15	Pneumatic actuators	Suitable to operate the butterfly valves	Fouress / Crescent/ AVCON	

S.No	Description of Requirement			Vendor's Response
	S.No	INSTRUMENT	DESCRIPTION	PREFERRED MAKE
	16	Microprocessor PID	Air/fuel ratio control	Yokogawa/ Honeywell



Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP

	TEMP controllers			
17	Blind Temperature controllers	For excess temperature control	Yokogawa/ Honeywell	
18	Gas leak detector	To detect gas leakage and give alarm/indication	Vendor to specify the make subject to BHEL approval	
19	Rotameter	To indicate LPG flow rate	Yokogawa	
20	Portable programming unit (LAPTOP)	To handle PLC logic network	Vendor to specify the make subject to BHEL approval	
2.39	<p>Motor control centre:</p> <p>2.39.1 This shall be a self-standing, dust and vermin proof, sheet metal fabricated panel and should be complete with internal wiring and switchgear cabinet with Main incomer, Starters for motors and Thermal overload relays with single phase preventing feature.</p> <p>2.39.2 M.C.B. [Miniature circuit breakers] for each feeder. Fuses, lamps. Control transformer, 1 kVA. Emergency change-over switch of suitable rating for the operation of conveyor drive by an auxiliary power supply in case of failure of main power supply.</p> <p>2.39.3 Direct Torque Control AC drive and necessary protection for the same.</p>			
2.40	<p><u>P.L.C. System and control panel:</u></p> <p>2.40.1 Entire operation shall be controlled by P.L.C. based control panel comprising P.L.C. C.P.U. and related hardware [Siemens / GE Fanuc /Yokogawa), 15"touch screen Human machine interface, 1 No. commercial P.C.(Engineering station),printer with SCADA and programming software.</p>			

S.No	Description of Requirement	Vendor's Response
	2.40.2 Memory:(According to requirement. Vendor to specify).P.L.C. system shall control the temperature of various zones; provide necessary interlocks and also the sequence of operation.	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 13 of 13

	2.40.3 Standby CPU (for PLC) is to be provided with hard wired back up facility as redundancy to take over control functions if working CPU fails. It should be bump less auto transfer without affecting other aspects of total system.	
	2.40.4 Communication redundancy also is to be ensured.	
	2.40.5 Latest version of CPU is to be supplied. CPU (for PLC) and I/O cards must be same family. The variables like temperature, flow, etc., will be stored using SCADA package and historical values can be fetched based on the batch code and time of processing the charge.	
	2.40.6 The control system should have touch screen 12" colour operator interface unit (HMI), which shall be located near the charging table. Based on the tube parameters and the properties, operator will select the programme and accordingly the line speed, temperature, etc., will get downloaded to P.L.C., which then controls the operation of the Furnace.	
	2.40.7 Each type of charge shall be given batch code before the charge and tracking of the charge shall be possible using the data base available at the P.C.	
	2.40.8 Supervisor should have the clear control as he can create various programmes and make a recipe for the operator. Operator can only select the programmes made earlier by the supervisor using the chart available with him, thereby reducing errors caused by improper operator entries. Temperature control shall be done at the P.L.C. using the algorithm and thereby control each zone temperature.	

S.No	Description of Requirement	Vendor's Response
2.41	<u>Electricals and control system:</u> <ul style="list-style-type: none">These shall consist of motor control centre and a programmable logic control system, as also necessary instrumentation. Temperature in control zones shall be measured by thermocouples. Thermocouples are to be installed in each zone and connected to P.L.C.	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 14 of 14

	panel through temperature transmitters.	
2.42	<u>Burner control system:</u> 2.42.1 Burner control panel is to be provided with selector switch for mode of operation, annunciator lamps for failure and operation, completely wired up to ignition electrode. The burner control panel shall be installed near the Furnace. Burner lighting should be possible from the burner control panel and P.L.C. system with flame failure alarm in the P.L.C. / SCADA. Each burner control panel shall be housed with following instruments.	
	2.42.2 Automatic ignition systems / burner sequence controllers. MPT based control system for pulse firing, power supply rack. Selector switches [Positions: Auto, Test, OFF].	
	2.42.3 Auxiliary relays and any other devices to carry out the firing system efficiently and due considerations have to be given for safety.	
2.43	<u>Other Instrumentation:</u> The following instruments are to be provided for measuring the parameters:	
	2.43.1 PLC system with CPU hardware redundancy to ensure bump less auto transfer of program.	
	2.43.2 The standby CPU to take control function if live CPU fails. CPU and I/O cards should be same family. Offered PLC system should be the latest version. Touch screen type operator interface on the operator panel for local control and data logging.	
	2.43.3 Two ('K' Type) Thermocouples with temperature transmitter per zone for control of the temperature.	
	2.43.4 Tachogenerator / Encoder for recording the Furnace line speed.	

S.No	Description of Requirement	Vendor's Response
	2.43.5 Flow meter-cum-totalizer, D.P.T for measuring the gas and protective gas consumption. Rota-meter type flow meter for distribution of protective gas in various chambers.	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 15 of 15

	2.43.6 Pressure switches, pressure gauges for combustion air, cooling air and cooling water line supply header. Flow switch and emergency solenoid valve for cooling water. kWh Meter for recording the electricity consumption.	
	2.43.7 All the instruments are to be supported by their calibration / test certificates conforming to applicable standards.	
	2.43.8 Also manuals / data sheets are to be provided along with technical offer explaining the type of controls and compliance of effective combustion control.	
2.44	PC Specifications / Details IBM Think-Centre Stand-alone PC (17 " monitor & CD ROM Drive) Intel Pentium 4 Processor with core speed at least 2.4 GHz (533 FSB) Intel 845 Chipset. 512 MB DDR 266 memory, provision for adding additional 512 MB RAM. 4 X AGP with 32 MB VRAM on AGP slot , 1024 x 768 resolution 17" SVGA NI Color Monitor(Samsung Make) 40 GB ultra ATA 100 at least 7200 rpm HDD with on board dual channel controller 52 X CD ROM drive 104/107 keys mechanical IBM key board with key skin , IBM optical mouse with pad. Integrated audio and 10/100 Mbps Ethernet card with LAN support & remote boot EPROM At least 2 serial + 1 parallel + 2 USB Ports, Client management software. Suitable rating UPS with 12 V 7 AH SMF battery 2x 5 Amp, power sockets power shutdown software and communication interface.	

3. SCOPE OF SUPPLY:

S.No	Description of Requirement	Vendor's Response
3.1	Heating section assembly.	
3.2	Intermediate vestibule assembly.	
3.3	Inlet vestibule assembly.	
3.4	Outlet vestibule chamber assembly.	
3.5	Cooling chamber assembly.	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 16 of 16

3.6	Single ended outer radiant tube assemblies per zone – Vendor to specify	
3.7	SS-316 Tube bundles for primary cooling chambers with inlet manual valves.	
3.8	Deflector plates for heating section, intermediate vestibule in static cast heat resisting steel in HK grade.	
3.9	M.S. fabricated Deflector plates for unlined inlet vestibules, outlet vestibules and water jacket cooling chamber.	
3.10	S.S. fabricated Deflector plates for primary cooling chambers.	
3.11	3 Nos. Radiation curtains with Spring Steel flapper and fibre glass cloth at inlet and outlet of vestibule.	
3.12	2 Nos. Motorized operated doors for inlet and outlet.	
3.13	Complete roller end sealing arrangement comprising of cast bearing housings, roller seals, end caps, circlips, 'O' rings, etc.	
3.14	Chain pressing unit and idlers.	
3.15	Keys, studs, locking plates for rollers.	
3.16	Combustion system as per the following: 3.16.1 Single ended gas fired self-recuperative radiant tube burners with spark ignition electrodes (LBE make Germany / ESA PYRONICS / ECLIPSE) 3.16.2 Inner tubes made from silicon carbide /SiSiC. 3.16.3 Air / Gas Orifice meters, gas adjusters for individual burner. 3.16.4 Automatic burner control unit for individual burner. 3.16.5 Ignition transformers in protective boxes for individual burner. 3.16.6 Air solenoid valve for individual burner. 3.16.7 Gas solenoid valves for individual burner. 3.16.8 Flexible bellows for air / gas 3.16.9 Pulse firing system for each zone.	
S.No	Description of Requirement	Vendor's Response
3.17	Complete Rollers for heating section.	
3.18	Rollers for cooling chamber.	
3.19	Complete M.S. Rollers for inlet vestibule, cooling chamber, outlet vestibule, charging and discharge tables.	
3.20	Complete Simplex sprockets with finish bore and locking arrangement.	
3.21	Simplex roller chain. Gear box make: Elecon / New Allen berry / Bonfiglioli /Greaves	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 17 of 17

3.22	Base frames for gear boxes and bearings.	
3.23	2 Nos. Combustion air blowers with motors, manual dampers and 2 nos exhaust blower.	
3.24	Charging and discharge table assembly with 4 nos of ID FAN	
3.25	Complete Refractory and ceramic fibre lining.	
3.26	Complete Plummer block bearings with housings for rollers.	
3.27	Variable voltage and variable frequency A.C. drive for main drive	
3.28	Main drive helical gear motor NORDE / IC BAUR	
3.29	Complete piping, fittings, manual valves, hoses, clamps, pipe supports for gas, air, cooling water, and protective gas from our battery limits. Guards for lay shaft and chain drive.	
3.30	<u>Pneumatic system</u> : Compressor, valve stand, FRL, cylinder Hoses, Fittings, Fire Sleeve. – PARKER / REXROTH make.	
3.31	Complete M.S. Ducting for combustion air header and flue exhaust headers.	
3.32	Complete hardware, nuts, bolts, packing and sealing materials.	
3.33	Erection and commissioning of total system.	
3.34	LPG/CNG supply, Electrical Supply, N2 gas. Cooling water and Compressor air supply shall be given at one selective point. Further distribution to be done to meet the requirement.	
3.35	P.L.C. System comprising of: [Siemens / GE Fanuc / Yokogawa / ABB].C.P.U. Power supply, Digital input cards. Digital output cards. Analog input cards. Analog output cards. Touch screen operator interface unit 12" size colour mounted on the panel at the charging table [for the operator to enter batch code and program for the charge].	
S.No	Description of Requirement	Vendor's Response
	Programming software for P.L.C. SCADA Software. Flow meter for L.P. gas and protective gas. Encoder for measuring conveyor speed. Kwh Meter for measuring electric consumption.	
3.36	Temperature transmitters with thermocouples. Rotameters for protective gas.	
3.37	PC, printer and UPS for PLC system. M.C.C. Panels, PLC panel and Burner control panels.	
3.38	Emergency cooling water solenoid valve. Flow switch for cooling water	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 18 of 18

	supply.	
3.39	Insulation and aluminium cladding of hot duct, Chimney, supports and its erection.	
3.40	Pressure switches and pressure gauges for LPG, combustion air, protective gas, cooling water line.	
3.41	Temperature indicators for cooling water inlet and outlet temperature.	
3.42	Fume extraction system with blower and damper.	
3.43	Power Cables, Control cables. Compensating cables and communication cables to link total electrical and electronic & instrumentation system with cable trays.	
3.44	Cross conveyor type automatic loading and unloading system for tubes [Optional price quoted] comprising of the following: Fabricated structure for loading and unloading tube collecting cradle with lifting belts, pulleys. Lift mechanism for cross-conveyor. Hydraulic power pack with cylinders and pipe fittings. Gear motors for cross conveyors and lifting trough. Special cross conveyor chains and sprockets. Limit switches, proximity switches, control desk. Fast charging and discharging gear motors with DTC drives.	
3.45	<u>Hydraulics</u> : Pumps, Valves, Filters, Fittings, Hoses, Cylinders, Accumulator – PARKER / REXROTH make	
3.46	Foundation outline drawing with load data should be provided to enable us to prepare the detailed civil engineering drawing.	
3.47	Performance test & trial at SSTP	

4. SPECIAL INSTRUCTIONS:

The Supplier shall furnish the following:

S.NO	Description of Requirement	Vendor's Response
4.1	The capacity of the furnace is 7.5 MT per hour. SSTP/ BHEL may operate the furnace at reduced capacity (at 3-5 MT per hour) depending on the load to be processed. Keeping in view the energy savings, necessary changes, if any, towards this may be indicated.	
4.2	Heat balance calculations for the reference size tube of T91 and at operating temperature of furnace. Sizes : 38.1X9.1; 44.5X5.6; 50.8X6.1; 57.2X9.1; 63.5X4.5; 76.2X5.1	
4.3	Efficiency of furnace with and without recuperator	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 19 of 19

4.4	Requirement of LPG per MT For reference tube sizes– refer 4.2	
4.5	Drawings/ technical specifications, to arrange procurement of the items in the scope of SSTP/BHEL	
4.6	All fasteners, pipe fittings shall be metric sizes	
4.7	All valves, fittings, flanges, pipes and hoses shall comply with DIN standard or equivalent ISO standards.	

5. FINAL RESULTS / PERFORMANCE TRIAL

S.NO	Description of Requirement	Vendor's Response
5.0	On complete commissioning of the furnace the supplier shall establish the results in respect of: 5.1 Output Capacity -material processed in Tons/hour for reference tubes. 5.2 Control of process parameters & surface quality of tubes processed 5.3 24 Hours functional load test 5.4 Heat Balance calculations 5.5 Combustion Efficiency & Thermal efficiency 5.6 Specific fuel consumption 5.7 Consumption of Electrical energy 5.8 Working of safety control system 5.9 Skin temperature	

6. TRAINING:

S.NO	Description of Requirement	Vendor's Response
6.0	Training of personnel related to operation and maintenance shall be arranged by vendors.	

7. The Following commercial points also may be confirmed.

S.No.	Description	BHEL Offer / Requirement	Vendors response
7.1	DELIVERY	8 Months from the date of purchase order	

**Technical Specification for 7.5 Tons/Hr Continuous Discharge Roller Hearth Heat Treatment Furnace at hot mill/SSTP**

Page 20 of 20

7.2	PREDISPATCH INSPECTION	7.2.1 Shall be carried out at Vendor's Works at different stages. 7.2.2 Performances test wherever applicable shall be conducted by BHEL Officials at vendor works before despatch.	
7.3	WARRANTY	The equipment shall be warranted for a minimum Period of 12 months from Commissioning or 18 Months from the date of dispatch whichever is earlier	
7.4	TRAINING	Refer Clause 6.0	
7.5	PERFORMANCE	a) Performance shall be proved for min., max. & middle sizes b) Functional performance shall be proved for three Continuous shifts. C) Necessary test parameters shall be indicated in the Offer	