



An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

ENQUIRY

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Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
2620800091	27.09.2008	28.10.2008

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

Item	Description	Quantity	Delivery (Item required at BHEL on)
10	Combustion System with Instrumentation Panel as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	01 No.	30.11.2008

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 “2620800091”.

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

Manager / MM / Capital Equipment

Specification for combustion system with Instrumentation Panel:-

Scope:

The Combustion system, for 8 Tone Continuous discharge furnace, proposed to be install by BHEL to be designed, supplied, erected & Commissioned on the furnace. The Vendor will follow descriptive specification for the offer.

Combustion System Consists of:

Item Description:

- 1. Burners & Auxiliaries:**
 - a. Burner**
 - b. Air & LPG Piping & Insulation**
 - c. LPG Gas Train**
 - d. Impulse Line**
 - e. Burner Cooling Line**
- 2. Control System**
 - a. PLC / SCADA System**
 - b. Gas & Air flow measurement & Control System**
 - c. Ignition & flame Sensing system**
 - d. Temperature Measurement & Control**
 - e. LPG Leak Detection.**
- 3. Structures**

1. Burners & Auxiliaries:-

a. Burner:

Burners required are high velocity, nozzle mix Dual Fuel (LPG / NG) Therm Jet Burners of Eclipse make or reputed equivalent. (Local Make is Not Acceptable.) The salient features of the required ThermJet burners are:

Very high velocity Flame (up to 500 ft/s) & of flame length nearly 18 inch of 500 mm Water Column LPG Pressure at Burner Inlet with standard Pressure calibration.

Reliable automatic direct spark ignition without pilot burner.

Capacity: Nearly 1.26 Lakhs K Cal./ Hour. (11 Kg / Hour LPG)

Very low NO_x & SO_x emission

b. Air & LPG Piping & Insulation

Air line size Educative size, Indicates the Selected Volume & Velocity.

Zonal header	:	8"
Individual burner:	2.5"	
To recuperator:		16"
From recuperator:	20"	
Material	:	MS
Thickness	:	4.5 mm

Required No. Of flanges, fittings, elbows are in the scope of supply.
Supporting structural will be supplied by BHEL. However, design, fabrication, erection is in the vendor scope.

Gas line size Educative size, Indicates the Selected Volume & Velocity.

Zonal header	:	2"
Individual burner	:	$\frac{3}{4}$ "
Inlet Header	:	2"
Material	:	MS
Thickness	:	4.5 mm

Required No. of flanges, fittings, elbows are in the scope of supply.
Supporting structural will be supplied by BHEL. However, design, fabrication, erection is in the vendor scope.

C. LPG Gas Train

Component: LPG piping, Ball valve, Gas filter, Slam shutoff valve, needle valve, pressure indicator, Pressure regulating governors valves (One from 4.5 to 1.5 Kg/Sq.cm and other one for 1.5 to 500 mm Water Column.), Relief valve, High pressure switch, Solenoid valve, Close position indicator switch, Low pressure switch, Flow meter with totalize. Any other accessories required for safe operation shall have to specify the vendor. Complete detail of gas train system includes Specification, make, and model of the all accessories. Explanatory P&I Diagram is attached.

BHEL will provide LPG at one point near the furnace at 3.5Kg Pressure.
All piping for LPG fuel line up to burner is scope of supplier.

d. Impulse Line

All Impulse Line for Air & Gas to DP & for flow measurement system are in the scope of supplier.

e. Burner Cooling Line.

All Burner air-cooling line including header is scope of supplier.

Note:- Any items & Elements not described which forms part of the fuel & air supply system is including burner block & Burner Mounting plate , all fasteners, gas cuts etc. are the Scope of supplier.

2.Control system:-

A. PLC / SCADA System:-

PLC-PC based instrumentation with SCADA software system and MMI for the control loops:

It operates through a Personal computer and suitable SCADA softwares. The PID control loop with auto tuning function to be constituted within the PLC through intelligent software. Suitable interface, required softwares, programming device to up load, down load for PLC programme changing in future or up gradation of PLC version. Upgrade the soft wares should be supplied by the Vendor .The system to monitor furnace parameters with suitable mimics and on the colored screen , enhanced interlocks for safety of furnaces and process level of furnace automation ,continuous and efficient data logging and archiving etc.

It has to be shown block diagram picture of the furnace ,on the screen with actual temperature indication digitally in the different zones of furnace. The mimic will show the important parameters of the process with the burner status ,motor status ,control valve status ,process switch status etc. Suitable alarms will also to be generated for the faulty conditions and shown as a text display on the SCADA screen .Gas flow ,speed of the roller conveyers also to be indicated digitally or bar graph on the mimic .

All the variables of the furnace parameters like temperatures ,flow ,line speed etc. are to be automatically charted with respect t time and print out can be taken of any time segment /charge/batch .Complete details to be provided along with the offer. All the PLC modules covering in the system to be given in details . Make preferred :ABB ,Honeywell , GE FANUC and Yokogawa

Hot Standby for PLC:-

PLC Hot standby configuration to be with CPU with bi-directional change over. In case master CPU fails, the slave CPU to be taken over as bump less transfer. Alternatively the master CPU should take over in case of the failure of slave CPU.

PC & Printer :

To be provided with UPS for one hour power back up of Recorder and

PC .

b. Gas & Air flow measurement & Control System

Suitable Orifice Design selection and installation. Isolation valve, PID Based Gas & Air Flow regulation valves for four zones. The furnace will be divided in to Pre-Heating, heating, Socking & Stabilisation Zones. The Flow & Pressure transmitter necessary for control & measurement shall be in the Supplier Scope.

c. Ignition & Flame Sensing System:-

The burners used are direct spark ignited eliminating the pilot burners. Flame monitoring system to be U.V. sensor based for its reliability. A U.V.Scanner to be used to continuously monitor the flame when the burner is in operation. The flame supervision circuit is linked to the safety shut off gas valve provided for each burner. This enables to monitor the flame of each burner continuously even when the control is for a pair of burners.

d. Temperature measurement & Control System:

Zonal Control:-

Ratio zonal control system with PID action . Operation to be performed in both auto and manual mode through PLC and MMI .

The furnace is divided into four zones for the following controls:-

- 1. Rate of heating**
- 2. Soaking**

The required control elements such as rated modulating motors , orifice mounting, ratio regulators , sub assemblies ,other control accessories , mountings Impulse Lines, Control & Power cables ,Sensors ,Solenoid valves ,ignition transformers, spark plugs, UV Scanners as a complete System. Vendor to be specified make and model

Furnace over-temperature control

For excess temperature control of respective zone, it should be possible to set the limit value of each zone in PC and MMI. In case the zonal temperature overshoots the maximum set value, it should control the respective zone temperature along with raise audiovisual alarm. The detail of alarm summary should be logged in PC.

Zonal Thermocouple

Each Zone to be provided with 2nos of Duplex Thermocouples .One thermocouple for Temperature controller, 2nd for Excess temperature controller, 3rd for recorder and 4 th as a spare. T/c Location to be provided

at rooftop. Compensating cable to be laid through separate metal tray . Minimum 1 Ft space to be provided between tray and roof to avoid heat radiation .K type thermocouple and Protective sheath to be Inconel material .

Temperature recorder

6 point, 180 mm Chart width, micro processor based temperature recorder (Chino Laxson /Honeywell/Yokogawa make) to be provided in control panel to measure zonal temperature .

Instruments Control panel:

A separate Floor mounting type Instrument panel with all PLC modules ,wired with marked ferrules as per standard code for easy identification, Suitable marked terminal blocks to be provided. Constituent switchgear parts. Vendor to give detail for panel size , Painting , Cable entry etc . Details and specification to be given for Suitable contactor , MCB , Push buttons ,OLR , Indication lamps ,ON/OFF rotary switches , Isolators , selector switches and safety devices etc. Mimic indication unit to be provided with lamp indication for burners Firing.

Dimensional sketches of the entire control panel and detailed view of position and lay out controls and other MMI to be submitted .

Note:-

1. **An arrangement Drawing should be approved by BHEL Before starting the Wiring.**
2. **PLC and Related Accessories like I/O Modules, Power supply should be supplied in separate Panel.**

Instrumentation safety system

- 1) For Power failure, gas pressure high / low, air pressure low, should immediately shut off the main safety valve with audio visual alarm.
- 2) For Flame failure, furnace pressure high, Flue gas temperature high, Preheated air temperature high, warning alarm to be given
- 3) Additional safety may be suggested by the vendor
- 4) Manual shut off gas valve to be provided apart from the safety shut off valve .

e. Gas Leakage System:-

Minimum 4nos of Gas leak detectors to be provided to cover entire furnace leak zones ..A separate Bar graph indicator with two set point

to be provided for warning with light and sound for alarm . Parameter setting and controlling to be done through PLC ,MMI.

Temperature data logging

Trend and report format in Excel format shall be provided. Any data has to be stored for the minimum period of one year.

Specification, model, type make etc. of the following to be furnished :

Modulating motors or Ratio regulators ,Transmitter control valves , Solenoid valves ,Regulating valve ,Safety shut off valve ,Manual safety valve ,Instruments control transformer ,Ignition transformer , Pressure switches ,Tripping Push buttons , Pressure gauges , all the units mounted in Gas train system ,Sensors and other Control elements . Circuit breakers for individual Ignition transformers to be provided Suitable rated circuit breakers fuses, switches for Instruments, motors, transformers, solenoid valves should be provided.. Gas flow and Air flow shall have to be monitored through PLC/ MMI .Vendor should give all the details.

Interfacing:-

The Control System Panel Shall have interfacing facility with PLC Panel for all Control & Operation of electrical drives for the furnace such as Blower, Chamber Drive, Door Drive, Infeed Drive, Out feed Drive, Oscillation Drive. The Electrical Specification will have Details for supply & interfacing.

3. Structures

All structural materials requirement, such as Plate, Angle, I-Beams & Channel etc or required size & Quantity will be BHEL scope.

4. Simple schematic circuit diagram with instruments control system drawings

P&I to be submitted along with the offer for Technical evaluation.

5. Safety

Adequate measures shall be taken to design the system in accordance to the various safety norms followed while using LPG as fuel, along with all the safety requirements.

Furnace functions should be continuously monitored and alarm /Warning indications through lights / alarm number with message (on PC and panel) to be provided .

Emergency switches should be provided at suitable locations.

Approach and platform to be provided on the furnace roof to have a easy maintenance .

Cable trays , Cable glands ,Junction boxes and

6. General Condition:-

Reports

Reports to be generated and stored as data for verification at any time.

Documentation

Three sets of following documents (Hard copies and soft copies)in English language should be supplied along with the machine

1. P& I Diagram for combustion system
2. GA of Instruments panel
3. GA Drawing of furnace Operating & maintenance Manual with GA Drawing of
4. Electrical panel Power & Control Circuits diagram
5. Mimic diagram
6. Terminal block details for instruments panel
7. Component location diagram
8. Instrumentation circuit for complete system
9. PLC Ladder Diagrams with Flash Memory in both soft and hard form .
10. PLC soft ware ,SCADA soft ware to be given
11. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls .
12. Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided.
13. Trouble Shooting Chart for Main and all Sub-Systems
- 14 . Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable, Etc.
15. The vendor shall submit complete Master List of spare parts used along with item part number/ specification/ type, name and address of the spare supplier

Calibration certificate :

Calibration certificate is required for all Brought out items.

Pre-Dispatch inspection.

The Scope of supply systems & Components shall be offered for at supplier's works prior to dispatch.

7. Critical spares praise to be quoted

1. Power supply module -- 1 NO
2. Thermocouple module -- 1 NO
3. Digital input module- - 1 NO
4. Analog input module -- 1 NO
5. Digital output module -- 1 NO
6. Soft ware for PLC
7. Soft ware for SCADA & MMI
8. Solenoid valve - 10 Nos
13. Relay for UV Flame Detector - 2 Nos
- 14 UV Scanner - 5 nos
15. Gas leak detector - 2 nos
- 16.. Special type fuses -15 Nos
17. Circuit breaker - 5 nos
18. Thermocouple duplex - 6 Nos
19. Thermocouple Simplex - 4 Nos
22. Pressure switch for gas - 2 nos
23. Pressure switch for air - 2 nos
24. Panel , Indication lamp - 5 Nos
25. Gas flow indicator and totaliser - 1no
26. Ignition transformer -5 Nos
27. Ratio regulative valve- 3 Nos
28. Air pressure indicator- 2 Nos

29. Mechanical & Pneumatic Spares:

All types of Valves, Pressure Switches, Transducers, Flow Switches, actuators etc

30. Electrical /Electronic:

All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, spares for PLC controls and PC, Field Sensors etc.

9. TRAINING:

The Supplier shall train four of BHEL Engineers in the Operation, Trouble Shooting, Calibration and PLC systems at the Supplier's Works at free of cost.

10. ERECTION, INTERFACING OF ELECTRICAL PANEL WITH INSTRUMENTATION CONTROL PANEL & FIELD EQUIPMENT & COMMISSIONING

Complete Supply, Verification of Bill of materials at BHEL Site, Installation of Equipment, Erection of Pipings as Per the above scope, Calibration of all items (Instruments, PLC), start up, testing and commissioning in the furnace & it's controls & all other supplied equipment to put the furnace into operation and synchronising the load and proving the performance of the furnace at the rated capacity and for all stress relieving cycles upto the rated capacity and temperature with within plus or minus 10 degree of furnace temperature control during soaking is the specific job of combustion

and instrumentation control system. Datas needed will be supplied by BHEL for commissioning the system from other equipments and furnace as and when required. The vendor shall arrange required Engineers , Supervisors for proving the system after commissioning trials continuously for a week . Manpower, tools & tackles, plant and machinery are in the scope of the vendor.

Services:-

Service requirement like power, air, water, Cutting gas, Welding sets & Its accessories, Welding Electrodes shall be provided by BHEL at free of cost.

BHEL will also provide crane for handling and lifting during erection at site free of cost

BHEL Will Provide all Civil foundation work at free of cost.

External Insulation will be Provided by BHEL.

The Vendor shall bring commissioning spares required for commissioning of the machine within stipulated time

Schedule of Erection and Commissioning shall be submitted with the offer.

11. GUARANTEE:

24 months from the date of commissioning and acceptance at BHEL works for any Manufacturing defects, Installation defects & Performance Defects Including Equipment rating Deficiencies.

Furnace Information:-

NAME OF FURNACE	CONTINUOUS DISCHARGE -C D F		
CAPACITY	8 MT		
FURNACE LENGTH BREADTH HEIGHT IN mm IN INSIDE CHAMBER	16000	3850	800
NORMAL USE	Stress Relieving of boiler Coils like Economizer, Re-heater & Super heater.		
MAXIMUM CHARGE TEMPERATURE IN DEG.C	850		
MAXIMUM FURNACE TEMPERATURE IN DEG.C	1000		
Rate of Heating (selection has to be infinitely variable in the range specified)	35 to 200 °C / Hour		
Combustion air Pressure(Blower) = 500 mm wc	1000MM W.C		
calorific value of lpg	= 11000 Kcal/kg.		
Pressure inside of Furnace	= 2mm of wc		
Bottom Fire Brick thickness	= 300mm		
Side and Top wall thickness	= 250 mm ceramic fibre blanket of		

density 128 Kg/cum.	
Proposed fuel	= Liquid Petroleum Gas
L P G Pressure	= 500 mm wc
NO.OF BLOWERS	2
AIR BLOWER CAPACITY in cum./ Hr	20000
Maximum rate of Heating =150 deg.C / Hr.	

<u>SCOPE OF SUPPLY</u>	
TOTAL NUMBER OF BURNERS WITH BURNER BLOCKS	40
NUMBER OF ZONE	4
BURNER CAPACITY in K.Cal /Hr	126000
GAS CONNECTED LOAD IN KGS.	900
TEMP. CONT. UDC 2300	4
RATIO REGULATOR	4
Duplex Thermocouple	8
UV SCANNER	40
BURNER SEQ. CONT.	40
PR.GUAGES	5
CONTINUOUS RATED MOTOR IN AIR LINE	2
AIR LINE AUTO B/F VALVES	4
AIR & GAS MAN. B/F VALVES	76
GAS COCKS	40
GAS SOL. VALVES	40
IGNITION TRAFOS.	40
ZONAL CONTROL PANELS	4
PLC	1

Necessary Power & Control cables, Cable Racks & fixings Nails, Fasteners.	Required Quantity as Per furnace size & Layout Condition.
LPG MAIN SAFETY VAL. TRAIN	1

ITEM DESCRIPTION OF SUPPLY SCOPE:-

- 1 For the heat load requirement of furnace 40 Nos. of burners, including ignition rod and burner blocks
- 2 Burner mounting plates
- 3 Combustion air blowers of requisite capacity
- 4 Main gas valve train consisting of strainer, pressure regulator, pneumatically actuated ball valve and vent valves, pressure gauges, high and low gas pressure switch.
- 5 Burner gas solenoid valves
- 6 Burner pair gas solenoid valves
- 7 Adjustable orifice gas lock
- 8 Needle valves
- 9 Manual air butterfly valves
- 10 Pneumatically actuated butterfly valves for air
- 11 Manual gas shut off valves
- 12 UV sensors with heat seal assembly with purge nipple
- 13 Flame relays
- 14 Ignition transformers
- 15 Local ignition panels
- 16 Temperature controllers (1 No. Programmable PID Controller and balance are PID Controllers, for each furnace)

- 17 PLC based start stop control system with PLC panel
- 18 LPG gas piping with valves and fittings
- 19 Combustion air piping with fittings
- 20 Refractories burner blockss
- 21 Any instrumentation other than specified earlier and any new Instrumentation panel
- 22 All special cables, Control cables, Power Cables and Feeders
- 23 Utility requirement for testing
- 24 Furnace thermocouples

SCOPE OF SUPPLY OF COMBUSTION SYSTEM FURNACEWISE.MAKE DETAILS:-

Item No.	Item name	Make or equivalent reputed brand
1	Burner, Thermjet TJ100/ TJ075 / TJ050	Eclipse, USA/UK
2	Temperature controller, UDC2300	Honeywell
3	Ratio regulator	Eclipse, USA
4	UV Scanner	Protection Controls, USA
5	Burner sequence controller	Protection Controls, USA
6	Pressure gauges	H.Guru / Fiebig
7	Control motor in air line	Dungs
8	Auto butterfly valves (air line)	Eclipse, India
9	Manual butterfly valves (air & gas lines)	Eclipse, India
10	Gas cocks	BDK / Audco
11	Solenoid valves in gas line (individual burners)	Avcon / Asco
12	Ignition transformers	Herco
13	Control panels (Zonal)	Precision
14	PLC	Siemens / Yokagawa
15	LPG main safety valve train	Dung's components; valve train assembled by Eclipse, India

In the Offer Make or Equivalent Reputed Technically BHEL Will take final Decision during Technical Evaluation.