



BHARAT HEAVY ELECTRICALS LIMITED
CENTRAL FOUNDRY FORGE PLANT

HEAT TREATMENT FURNACES – 100 MT & 30 MT

SPECIFICATION - FT/SP/51

1.0 DESCRIPTION:

This specification governs the requirements of Batch type Oil/Gas dual fuel Fired Heat Treatment Furnaces of capacity 100 MT and 30 MT.

2.0 OBJECTIVE:

The Heat Treatment Furnaces shall be used for Quality Heat Treatment of large size steel castings and forgings.

3.0 SCOPE:

Scope of supply includes design, manufacture, supply, erection and commissioning of the Heat Treatment Furnace at our works. The technical and general requirements of the machine are given below.

4.0 TECHNICAL REQUIREMENTS

4.1 Capacity & size: As per table given below

Capacity per batch	Height of door opening clearing bogie	Clear width of bogie clearing door	Clear depth of furnace/bogie loading length
100 MT	5000 mm	6500 mm	8000 mm
30 MT	3000 mm	4000 mm	6000mm

4.2 Type of burners

High velocity, fuel efficient burners, mounted on furnace walls, sufficient in number to attain maximum heat rate of the loaded job, with uniform temperature regime.

4.3 Temperature cycle – Provision of heating /cooling cycle @ 100 °C/hr (max) and 20 °C/hr (min).

- 4.4 Furnace must be able to maintain temperature uniformity of $\pm 7.5^{\circ}\text{C}$ throughout inside in the temperature range of 300°C to 1150°C
- 4.5 Maximum attainable temperature - 1150°C
- 4.6 Fuel – LDO / Furnace oil / LPG
- 4.7 Refractories
Ceramic fibre blanket lining for all the side walls, ceiling and door inside.
Bogie hearth and part of the furnace structure below bogie shall be lined with heat resistant refractory bricks.
- 4.8 Bogie movement
Sturdy rack and pinion system, electrically motorised in combination of gear box.
- 4.9 Door
For 30 MT furnace:
Door shall be operated for lifting and lowering with counterweight. The drive system shall include electromagnetic brakes. However, in case of emergency provision for manual operation should exist. As a safety measure, movement of door shall have limit switches and interlocking with bogie drive so that the bogie does not move and collide with the closed door.
For 100 MT furnace:
Door shall be split vertically in two halves and horizontally sliding type. The two halves should overlap in closed condition of the furnace. As a safety measure, movement of door shall have limit switches and interlocking with bogie drive so that the bogie does not move and collide with closed door.
- 4.10 In closed condition of door, the seal should be comprehensive enough not to allow any heat loss through door joints.
- 4.11 Air-fuel ratio control should be automatic throughout the heat treatment regime. The 100 MT furnace shall have six temperature control zone whereas 30 MT furnace shall have four temperature control zone. Combustion and atomising arrangement shall have both auto and manual control.

4.12 Underground flue off take from the furnace with suitable height to suit natural draft self standing chimney shall be provided. Height of the chimney should also conform to air pollution norms.

4.13 One multi-tubular channel type recuperator for preheating the combustion air to a temperature of 400 °C and separate recuperator for preheating atomising air to 150°C shall be provided. Material of tubes should be so selected that recuperator works without dilution air injection in flue duct.

4.14 Automatic pressure control system in the furnace should ensure no infiltration of cold air from outside.

4.15 Outside shell temperature of furnace not to exceed 30°C of outside ambient temperature.

4.16 Furnace should be complete in all respects including damper and its control to maintain the furnace temperature.

4.17 Furnace supplier must provide electric heat tracers from heating pumping unit to all the burners along with electric circuit in the panel.

4.18 Stand-by blower with bypass line of combustion air and atomisation air to be provided alongwith the main blowers.

4.19 Heating and pumping unit shall be capable of heating LDO upto 100 °C

4.20 Process Control: Air/fuel ratio control should be automatically adjusted in order to maintain temperature in the furnace. The mode of control should be through PID type temperature control through PLC. Similarly the Furnace pressure should also be controlled through PID type pressure control through PLC. PLC is to be Siemens make or equivalent and PROFIBUS enabled.

4.21 Supplier should provide suitable temperature indicating and recording instruments to record temperature of casting at minimum 6 locations. Details of the same should be given in the offer. Temperature recorders are to be of China-Luxon make

4.22 Electricals – AC supply of 415V, $\pm 5\%$, 3 Phase, 4 wire, 50 c/s shall be used to the run the furnace. The electrical equipment for the furnace shall be complete in all respects and shall include AC motor and motor control center. The motor control center should be provided with necessary isolators, contactors, fuses, overload relays, push buttons, lamps, etc. System to be fuseless to the extent possible. MPCBs/MCC are to be used in place of fuses for motor protection. All major electrical switchgear to be of Siemens/L&T make.

5.0 DETAILS TO BE INCLUDED IN THE OFFER:

Following details are to be included while submitting the offer

1. General arrangement drawing showing the
 - (a) Space requirements
 - (b) General features
2. Type of burners, motors, refractories, etc and their make.
3. Names and addresses of customers where similar heat-treatment furnaces have been supplied.

6.0 DOCUMENTS TO BE PROVIDED WITH SUPPLY:

Following documents shall accompany the supply of heat treatment furnace.

- (a) Operation and Maintenance Manual
- (b) Electrical circuit diagram
- (c) Assembly drawing showing placement of different drive units, fuel flow line, burners, thermocouple locations, make and rating of all the drives.
- (d) Details of all bought out items, their specifications, name of suppliers.
- (e) Test certificates
- (f) Foundation drawing

7.0 MISCELLANEOUS

- 7.1 The equipment is to be guaranteed against defective workmanship, design, material and smooth and efficient operation for a period of 24 months from the date of commissioning.
- 7.2 Spares and tool kit necessary for 2 years of smooth running of furnace to be provided alongwith the furnace.
- 7.3 The supplier shall depute their representative for erection and commissioning and conducting trial run of the furnace.

7.4 Please note that maximum height of crane hook available above ground level is 9 M.

Furnace parameters should work within these constraints.

7.5 PLC Programming Kit, complete set to be provided.

8.0 INSPECTION, DEVIATION AND REPLACEMENT

8.1 The furnace shall be inspected at CFFP, BHEL which will be binding on supplier. If the equipment received at CFFP is not found in accordance with the requirements, it shall be rejected.

8.2 BHEL reserves the right to inspect equipment at site before despatch. The supplier shall give prior intimation in such case. The supplier shall submit a copy of test certificate in advance of the equipment offered for inspection. However inspection at BHEL, CFFP shall be final. The supplier shall offer BHEL representative all reasonable test facilities without charge to satisfy the latter that the equipment is being furnished in accordance with this specification.

8.3 For any deviation from the specification demanded by the supplier, prior approval of BHEL must be obtained in writing.

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