



Expression of Interest

for

Major Repair and Accuracy Restoration of CNC Lathe
Model-D2300NYF, Make-HOESCH MFD; Plan No.-3/2-360

Bharat Heavy Electricals Limited
Haridwar, Uttarakhand

DISCLAIMER

The information contained in this Expression of Interest document (the "EOI") or subsequently provided to Applicant(s), whether verbally or in documentary or any other form, by or on behalf of BHEL or any of its employees or advisors, is provided to Applicant(s) on the terms and conditions set out in this EOI and such other terms and conditions subject to which such information is provided.

The purpose of this EOI is to provide interested parties with information that may be useful to them in the formulation of their application for qualification pursuant to this EOI.

BHEL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Applicant upon the statements contained in this EOI.

The issue of this EOI does not imply that BHEL is bound to select and shortlist Applicants or to enter into any agreement with any Applicant for the Project.

Bharat Heavy Electricals Limited

1.0 Introduction:

- 1.1 BHEL is an integrated power plant equipment manufacturer and one of the largest engineering and manufacturing organizations in India catering to the infrastructure sectors of Indian economy viz. energy, transportation, industry and non-conventional energy. The energy sector covers generation, transmission and distribution equipment for hydro, fossil, gas fuels and renewables. The transportation sector covers propulsion systems for Electric locomotives, Motors, alternators and transformers and electric locomotives.
- 1.2 BHEL's growth has been synchronous with achieving self-sufficiency in the indigenous manufacturing of heavy electrical equipment. Out of the available 35,000 MW per annum capacity for power plant equipment manufacturing in the country, BHEL alone constitutes a mammoth 20,000 MW per annum capacity. A widespread network of 17 Manufacturing Divisions, 2 Repair Units, 4 Regional Offices, 8 Service Centers, 4 Overseas Offices, 6 Joint Ventures, 15 Regional Marketing Centers and current project execution at more than 150 project sites across India and abroad corroborates the humungous scale and size of its operations. More details about the entire range of BHEL's products and operations can be obtained by visiting our web site www.bhel.com.
- 1.3 The Heavy Electricals Equipment Plant (HEEP) is one of the major manufacturing units of BHEL. The core business of HEEP includes design and manufacture of large size steam turbines, turbo generators, heat exchangers, condensers and auxiliaries. A large nos. of machines are used in the plant to manufacture variety of capital goods and products. With a view to restore the accuracies of ageing Machine tools / Equipment and upgrade them suitably with state of the art technologies wherever possible BHEL aims to extend the useful life of plant & Machinery and to upgrade Plant & Machinery technologically.
- 1.4 In line of above objectives BHEL is planning for Major Repair and Accuracy Restoration of CNC Lathe, Model-D2300NYF, Make-HOESCH MFD, Plan No. - 3/2-360 at HEEP, Haridwar. For the same BHEL intends to get this work done by a suitable party / vendor as per indicative scope of supply & work given in Annexure-I.
- 1.5 BHEL shall receive Applications in pursuant to this EOI in accordance with the terms set forth herein and all Applications shall be prepared and submitted in accordance with such terms on or before the date specified in this EOI for submission of Applications.

2.0 Brief Description of EOI Process:

- 2.1 Through this EOI, BHEL expects to discover suitable vendors for "Major Repair and Accuracy Restoration of CNC Lathe Model-D2300NYF, Make-HOESCH MFD; Plan No.-3/2-360" at BHEL Haridwar. Further deliberations and discussions shall be made with the suitable vendors to finalize the Scope of Supply & Work and to obtain budgetary price for this work.
- 2.2 Subsequently, a tender shall be floated as per BHEL policy, inviting vendors to participate and offer firm technical & price bids.
- 2.3 The EOI can be submitted by hand or sent by Registered Post so as to reach before 01:45 PM. on 27th February, 2018 at the following address. A signed copy of the EOI may be sent by e-mail also.

"TENDER ROOM, PPX,
4th FLOOR, MAIN ADMINISTRATIVE BUILDING,
HEEP, BHEL, HARIDWAR,
UTTARAKHAND-249403
INDIA"

Email ID - harora@bhelhwr.co.in

- 2.4 Any request for further information or clarification on the EOI document may be sought from Mr. Himanshu Arora, Sr. Engineer (WEX-MCR) at the email ID - harora@bhelhwr.co.in, Ph. +91-1334-281176, Mob. - +91-9759372600.
- 2.5 All EOI documents should be in English and signed by duly authorized representative on each page of the documents. Emphasis should be on completeness and clarity of contents.
- 2.6 BHEL may seek any further clarifications on the documents submitted by the prospective applicants at any stage to complete the evaluation of EOI.
- 2.7 No price bid is required to be submitted against Expression of Interest.

3.0 Machine Specifications:

A. Main Machine:

1. MAKE: HOESCH MFD, GERMANY
2. Year of Manufacture: 1981
3. MODEL: D2300 NYF
4. Distance between centers: 18000 mm
5. Swing over saddle: 2300 mm
6. Max Wt. of the job: 320 T (with one steady support)
160 T (without any steady support)

B. Headstock:

1. Diameter of the headstock-faceplate: 3100 mm
2. Clamping range of the work-piece in the jaws of the headstock-faceplate with external clamping
 - a. 8 Clamping jaws (with extension pcs.): 600-2200 mm
 - b. 4 Clamping jaws (with extension pcs.): 250-2200 mm
3. Diameter of the front bearing of the main spindle at the headstock: 800 mm
4. Angle of centers: 75 degree
5. Maximum load on Faceplate: 1600 KN
6. Capacity of the main drive: 147 kW
7. Speed range of the headstock -faceplate: 0.5 -125 rev/ min
8. Maximum torque at Face plate: 125000 Nm

9. Spindle DC motor make: Siemens-Haschke

C. Saddle:

1. Max. chip removal - main cutting force (Conventional turning): 100000 N
2. Max. chip removal - main cutting force (overhead turning): 80000 N
3. Travel of the cross slide: 1100 mm
4. Range of the feed speeds of the saddle
 - a. Longitudinal and transverse (Step less): 0.01 - 2000 mm/min
 - b. Speed of rapid traverse longitudinal and transverse: 5000 mm/min

D. Tailstock:

1. Max. load by the work piece at the tailstock: 800 KN
2. Angle of centers: 75 degrees
3. Rapid speed of barrel approx.: 500 mm/min

E. Hydrostatic Steady:

1. Diameter range steady I (with extensions piece): 250 - 900 mm
2. Max. load of steady I: 800 KN
3. Diameter range steady II (with extension pieces): 800 - 1300 mm
4. Max. load steady II: 1600 KN
5. Adjusting speed of steadies on the bed approx.: 1500 mm/min

4.0 Eligibility of Applicants:

4.1 The vendor must have experience of Manufacturing / Reconditioning of a machine meeting one of the following requirements:

- a. Manufacturing of new CNC lathe machine having Hydrostatic Guideways and Hydrostatic Worm & Worm Rack System in Z-Axis (vendor to mention Z-axis traverse)

OR

- b. Reconditioning and retrofitting of lathe machine meeting all of the following requirements except (iii) which is desirable but not mandatory for consideration of the offer:
 - i. Overhauling of Headstock (including replacement of Spindle Bearings) of a lathe machine.
 - ii. Reconditioning of Z -axis of a lathe machine having Hydrostatic Guideways and Hydrostatic Worm & Worm Rack System in Z-Axis (vendor to mention Z-axis traverse). The reconditioning should include repair of worn out Worm & Worm Rack with fresh coating of DIAMANT moglice/equivalent material or replacement of old Worm & Worm Rack assemblies with new one.
 - iii. Retrofitting of a Lathe / Vertical Borer / Horizontal Borer / Machining center with CNC control and servo drives.

Note: With reference to 4.1 (b) i, ii, iii these three activities may be carried out on three different machines.

4.2 Vendors having Work orders/ Purchase orders of work mentioned in Para 4.1 and where the work is under progress, can also participate in EOI.

4.3 Documentary evidence such as copy of P.O. / W.O. along with scope of supply & work in support of Para 4.1 & 4.2 shall be submitted. Customer's details such as Name, Address, Telephone No., email ID shall also be submitted by the vendor.

4.4 BHEL may verify the information provided by the vendor with the vendor's customers directly if considered necessary by BHEL. In that case vendor shall facilitate the visit of BHEL engineer(s) to his customer's premises. Boarding, lodging and travelling expenditure of BHEL engineer(s) for such visits shall be borne by BHEL.

Annexure-I

Indicative Scope of Supply and Work

Sl. No.	Description	Vendor's comments
1.0	<p>Checking & recording of existing machine condition by the Vendor with his personnel and measuring instruments as follows:</p> <ul style="list-style-type: none"> • Measurement and recording the existing geometrical accuracies w.r.t. OEM / Dr. Schlesinger's test charts. • Measurement /observation of vibration / noise etc. 	
2.0	<p>Removal of electrical & hydraulic connections and Dismantling of machine parts/assemblies which are to be reconditioned / repaired / restored. Necessary personnel and tools shall be in vendor's scope.</p>	
3.0	<p>Joint Inspection shall be carried at BHEL along with vendor's experts during and/or after the above mentioned activities to identify and finalize the list of worn out/damaged parts which are not covered/mentioned in the scope of supply and work but required to be replaced or repaired for accuracy restoration of the machine.</p>	
4.0	<p>Complete dismantling of assemblies into individual parts, de-greasing, chemically cleaning and pre-painting of structural /fabricated parts.</p>	
5.0	<p>Supply and replacement of the following Spindle Bearings:</p> <ol style="list-style-type: none"> 1. Front Roller Bearing: CYLINDRICAL ROLLER BEARING NNU 49/800 BK/SP 2. Rear Roller Bearing: CYLINDRICAL ROLLER BEARING NNU 49/600 BK/SP 3. End Thrust Bearing: AXIAL CYLINDRICAL ROLLER BEARING, 81284-P 5 4. End Thrust Bearing: AXIAL CYLINDRICAL ROLLER BEARING, 81180-P 5 <p>The bearings shall be manufactured so as to meet accuracy requirements as per OEM test chart. Vendor shall supply test certificates of bearings.</p>	
6.0	<p>Overhauling of Headstock Gearbox and Restoration of its Hydraulic & Lubrication System:</p> <p>Overhauling of existing headstock gearbox.</p> <p>Overhauling and restoration of overall lubrication and hydraulic systems of the headstock by replacing pump-motor sets, valves, digital pressure switches, filters and seals etc. Lubrication for all parts of the headstock shall be ensured with the help of flow monitoring and feedback elements for all individual points in gearbox, bearings etc.</p> <p>Temperature supervision of main spindle bearings shall be installed. Vendor has to suggest technical scheme & details of installation of new thermocouples/RTDs for temperature monitoring.</p>	

7.0	<p>Overhauling of Headstock Lubrication System: Existing oil lubrication system of the headstock/spindle gearbox oil/spindle bearings shall be overhauled. Oil distributors shall be cleaned. Existing Pump -motor set (Inner geared pump, Make Bucher, QT 31/020, Q=28.6 l/min. with 1.5 KW 1410 RPM motor) for lubrication shall be replaced with new equivalent sets. Three pressure switches placed in delivery lines of oil flow shall be replaced with new digital pressure switches.</p>	
8.0	<p>Overhauling of Faceplate Hydrostatic pad: Hydrostatic pad is located at a casting construction connected to the foundation through anchoring bolts. The pad has been put onto a double wedge which allows a height alignment of the pad and adjustment of hydrostatic gap. The pad has total 4 pockets. All pockets are fed by a pump whereby capacity amounts to approx. 5lpm/pocket. The ideal hydrostatic gap between faceplate and bearing shell of the pad should be 150µm. The following activities shall be performed by the vendor to restore the accuracy of Faceplate Hydrostatic pad:</p> <ul style="list-style-type: none"> i. The top bearing surface of the Hydrostatic pad shall be made uniform by laying a coating of diamant-moglice or any other suitable material to maintain uniform gap between Face plate and Hydrostatic Pad. The vendor has to suggest and provide details of the material and process used / to be used for similar applications. ii. Supply and Replacement of Pump-motor set along with suitable couplings. Details of existing pump and motor sets are as given below: <u>Axial piston pump, Make - Parker-Hannifin, PAV 16 RK-Ma; Qmax = 24 l/min with 7.5 KW 1450 RPM motor</u> iii. Supply and Replacement of all solenoid valves, non-return valves, pressure switches, filters used in the Faceplate Hydrostatic circuits. 	
9.0	<p>Overhauling of X-axis drive gearbox. X-axis ball screw and ball nut shall be supplied and replaced along with the bearings and bearing housings of Ball screw shall have backlash free double nut, with centralized lubrication. Vendor has to furnish the type, make and accuracy grade of the offered ball screw. The vendor also has to suggest, along with technical scheme & details of new Alpha/ZF/DESCH make gearbox with identical/near-identical reduction ratio for replacement of existing gearbox.</p>	
10.0	<p>Overhauling and Restoration of hydrostatic worm and worm rack system of the Z-axis.</p> <p>This work shall also include the following:</p> <ul style="list-style-type: none"> a. Re-laying of the diamant-möglice coating of all the 18 no. of racks (one meter each) of Z-axis/ replacement of racks if found damaged. b. Re-laying of the diamant möglice coating on the hydrostatic worm/replacement of worm if found damaged. c. Complete restoration of the hydrostatic system by replacing pump(s) with motors, filters, Valves, Digital flow and digital pressure switches, nozzles, tubes etc., with new equivalent set. d. Proper hydrostatic gap between Worm and Rack shall be maintained. 	

11.0	<p>Overhauling of Saddle Hydrostatic System:</p> <p>Hydrostatic system of carriage saddle (X and Z-axes) shall be overhauled and restored by replacing existing pumps, pipings, pressure switches, line filters, distributors, valves, hoses, NRVs and nozzles etc. with new Vogel-make pumps and other items. The existing system is having following type of pumps:</p> <ol style="list-style-type: none"> 1. Three W. Vogel-make pumps for Z-axis hydrostatics, clamping and guide plates. (Type -ZM2101) 2. Two W. Vogel-make hydrostatic pumps for X-axis hydrostatics, clamping and guide plates. (Type -ZM2102) 	
12.0	<p>Overhauling of Saddle Slides: Linings of all the slides of X and Z-axes shall be replaced, after removing the existing material, by pasting suitable anti-friction bearing material such as Turcite-B/Biplast/Castable resin like Diamant möglice etc. Slide ways shall be ground/scraped and blue-matched with beds. For proper matching of slides with bed, machining / grinding of beds may also be done if required.</p>	
13.0	<p>New lubrication system for Z-axis (longitudinal traverse) gearbox lubrication shall be supplied. Lubrication shall be ensured in appropriate quantity and rate. Associated digital pressure switches, pipes and wipers shall be replaced. Pressure, flow and float switches shall be interfaced with PLC to ensure proper monitoring and alarm system.</p>	
14.0	<p>New lubrication system for X-axis (cross traverse) gearbox and ball lead screw/ball nut lubrication shall be provided. Lubrication shall be ensured in appropriate quantity and rate. Associated digital pressure switches, pipes and wipers shall be replaced. Pressure, flow and float switches shall be interfaced with PLC to ensure proper monitoring and alarm system.</p>	
15.0	<p>Overhauling of Swords/ Rams (I, II & III) clamping and traverse system which includes:</p> <ul style="list-style-type: none"> • Replacement of existing hydraulic power pack with a new power pack of identical rating and capacity. • Replacement of spring clamping cylinders, solenoids and pressure switches of Vickers/Hawe/Rexroth-Bosch/ Hydac/Parker make. • Repair/renovation/replacement of swords movement drive cylinders, seals other hydraulic elements as per requirement. • Replacement of existing proximity switches with new one for swords positioning. 	
16.0	<p>Overhauling of Steady Rests:</p> <ol style="list-style-type: none"> i. Overhauling of hydraulic/hydrostatic system of Steady Rest by replacing pump-motor, solenoid valves with manifolds, and digital pressure switches, seals and guide bushes & keys of central and side quills. All hydraulic components shall be of Vickers/Rexroth-Bosch/Parker/Hydac/Hawe-make. ii. Pad oil pressure adjustment according to rotor load is to be made adjustable through VFD drives and is to be interfaced with CNC control and the pressure is to be displayed on control. iii. Supply, installation and commissioning of new oil cooling and filtration unit of sufficient capacity for steady rest hydraulic/hydrostatic system. 	

	<ul style="list-style-type: none"> iv. Integration of all the elements of power pack and oil cooling unit onto the attached steady rest platform so that the entire system (power pack and cooling arrangement) along with the steady can be moved as a single unit. v. Overhauling of both steady rests longitudinal traverse mechanism. vi. Supply, installation and commissioning a new metallic drag chain carrying all the power and control cables of steady rest along the side of steady rest/tailstock beds. 	
17.0	Overhauling of main Oil chiller Unit by replacing and installation of pump motor set, valves, filters, digital temp. and oil level indicators.	
18.0	Overhauling of Mist-air coolant system by replacing valves, filters & mist air -coolant valve, flow controller, metal jacketed hot metal chips resistant tubes etc.	
19.0	<ul style="list-style-type: none"> i. Supply, installation and commissioning of new cable drag chain covered with steel sheet to replace old drag chain for Z-axis travel which is carrying various electrical and hydraulic hoses and travelling in the pit on the side of Z-axis guideways. ii. Supply & installation of new table top chain covers to replace old flat chain cover of about 140 mm width which is placed along the length of the Z-axis guideways at the level of the shop floor for protection of Z-axis cable drag chain. 	
20.0	Re-assembly of complete machine after completion of all the overhauling/repair/replacement activities mentioned above. Restoration of all electrical & hydraulic connections. Switching on the power supply and testing of machine.	
21.0	Disconnection and removal of existing CNC system Sinumerik 810, DC spindle drive & motor, feed drives & feed motors, electrical cabinets , operator pendant, all AC motors, limit switches, proximity switches and all the interconnected cables & complete wiring of the machine etc.	
22.0	Stabilizer and Ultra-Isolation transformer (400 KVA rating (Delta / Star Configuration) and power disconnecter (400 Amp rating, and with rotary knob) shall be supplied and installed by the vendor.	
23.0	<p>Retrofitting of the machine with latest CNC control, Servo Drives & Motors:</p> <ul style="list-style-type: none"> 1. Supply, Installation & commissioning of new electrical cabinets, operator pendant, hand held control panel, control transformers, CNC control, scales, encoders, DC spindle drive, DC Tachogenerator for spindle motor, AC servo feed drives & AC servo motors, distributed PLC, electrical switchgear, all field elements (proximity, limits, pressure & float switches) and wiring with a provision of proper cooling. 2. Supply of all type of power & signal cables, wires & other accessories and connection & interfacing between CNC control, electrical cabinet, drives, motors and other machine elements. 3. Supply and installation of Analog load meter for spindle load at control panel. 4. Supply and Installation of a new cable drag chains as per requirement. 5. Training of programmer and machine operators for new CNC control. 	

	<p>6. Training for maintenance of drives and control at system/control OEM place.</p> <p>7. All the existing features and capabilities of machine or more shall be proved and demonstrated by the vendor.</p> <p>8. All the mechanical and electrical fittings like flanges, pulleys, belts, brackets, couplings etc. if required for completion of work shall be in scope of vendor.</p> <p>9. The vendor has to provide complete schematic & details with make of offered CNC control, servo drives & motors.</p>	
24.0	All feedback elements such as limit switches, pressure switches, flow and float switches shall be replaced with new digital ones and interfaced with PLC.	
25.0	Interfacing and commissioning of CNC System, PLC, Axes and Spindle drives, sword movements, lubrication, coolant, hydraulic system, chip conveyor motors, scales and encoders.	
26.0	Development of PLC logic and interface drawings for complete functionality of the machine having all the existing functions with distributed PLC.	
27.0	Demonstration of all existing main functions (axes & spindle) and auxiliary functions (tool carriers, tail stock and quill, steady rests, Coolant system, hydraulics, hydrostatics, lubrication system, chip conveyer etc.) of the machine.	
28.0	Checking of Geometrical accuracies of complete machine as per OEM/ ISO Test chart (DIN8607/ISO 230 - 1). All accuracies should be within permissible tolerance limits.	
29.0	Laser calibration of X & Z axes using laser interferometer and generation of compensation data for pitch error and backlash by a reputed agency as per VDI standards.	
30.0	Machining of NAS/ISO Test piece as per OEM/ ISO standards.	
31.0	Machining on a work piece (provided by BHEL) for prove-out of different turning (straight, taper, radius turning cuts), grooving and threading operations. All the accuracies should be within limits / tolerances as per OEM/ ISO standards (DIN8607/ISO230-1).	