



An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY NOTICE INVITING TENDER

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TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two Parts	2621800008	30.07.2018	24.08.2018

You are requested to quote the Enquiry number date and due date in all your correspondence. 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.

Item	Description	Quantity
10	Heavy Duty High Vacuum Pump as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com and https://eprocure.gov.in)	1 No.

Important points to be taken care during submission of offer

1. Delivery terms shall be FOR BHEL Stores, HPBP, Trichy-620014.
2. Compliance Form No: TRY/IND/06 to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
3. Delivery period required is 4 months from the date of Purchase Order.
4. Erection and commissioning shall be done at BHEL Trichy by the supplier.
5. Time period required for Erection and Commissioning shall be 4 weeks from the date of intimation by BHEL
6. EMD applicable.
7. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions compliance form and technical specification can be downloaded from BHEL web site <http://www.bhel.com> and <https://eprocure.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2621800008".

Note: this is not an E-tender, hence Vendors are requested to ensure that the offer is reaching physically at our office before 14:00 Hrs. on the date of tender opening.

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

AJAY V. ASALKAR

Sr. Manager
MM: Capital Equipment / MM

BHEL - Tiruchirappalli - 620 014

PART - A
QUALIFYING CRITERIA FOR
HEAVY DUTY HIGH VACUUM PUMP

S.No	BHEL Specification	Bidder's Offer
1.0	QUALIFYING CRITERIA	
1.1	Bidder / OEM must have manufactured, supplied and commissioned at least ONE Diffusion/Turbo molecular type Vacuum pump are eligible to quote.	
1.2	Bidder has to submit at least ONE Performance Certificate from their customer (end user), for satisfactory performance of offered type (Diffusion OR Turbo molecular type) vacuum pump having ultimate vacuum level of 1×10^{-7} millibar or better meeting the following conditions: a) The Equipment must have been supplied within the last FIVE years as on the first date of tender opening. b) The Equipment must have performed satisfactorily for at least one year during this period. For obtaining the Performance certificate, a suggestive format is provided at the end of part-A.	
1.3	PO document for the above mentioned supplied equipment to be enclosed	
1.4	BHEL reserves the right to verify the information provided by the Bidder. In case the information provided is found to be false/ incorrect, the offer is liable for rejection.	

2.0	INFORMATION TO BE PROVIDED BY BIDDER	
2.1	Bidder shall provide contact details(phone no & email id) including the address of his Agents / Service Centres in India	
2.2	Details of Diffusion/molecular type vacuum pumps supplied to other BHEL units if any	
2.3	The BIDDER to furnish Reference List of Customers(max 10 customers) including Contact details(phone no & email id).	

SECTION 3

The BIDDER to note:

S. No.	PARTICULARS	Bidder's offer
3.1	The BIDDER shall submit the offer in Two Parts – 1. Technical [with PART A & PART B] & 2. Commercial and Price Bid.	
3.2	The Bidder's offer against each clause in PART A & B of the offer should be filled by the BIDDER compulsorily with complete details.	
3.3	The BIDDER shall assure a continuous support for Spares and Service for Ten Years, from the date of commissioning of the equipment at BHEL Works.	
3.4	The Technical Offer shall be supported by Product Catalogue and Data Sheets in original and complete technical details / literature on the quoted model of equipment.	
3.5	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation.	

Suggestive Format of Performance Certificate:

The performance certificate to be produced **on Customer's Letter Head.**

PERFORMANCE CERTIFICATE

- 1 Description of the equipment
- 2 Make & model of the equipment
- 3 Month & Year of Commissioning
- 4 Equipment type: Diffusion type / Turbo Molecular type
(Strike off whichever is not applicable)
- 5 Ultimate vacuum level of the pump system:.....milli bar
- 6 Application for which the equipment is used
- 7 Performance of the equipment Satisfactory / Not Satisfactory
(Strike off whichever is not applicable)
- 8 Service support after sales Satisfactory / Not Satisfactory
(Strike off whichever is not applicable)
- 9 Any Other remarks
- 10 This performance certificate was issued on: (DD/MM/YYYY)

Signature & Seal of the Authority
Issuing the Performance Certificate

Contact details of issuing authority
Name & Designation:
Office No/ Mobile no:
Email ID:

PART B

HEAVY DUTY HIGH VACUUM PUMP

1.0 BRIEF DESCRIPTION :

HIGH VACUUM PUMP SYSTEM: It is a Pumping station consisting of a High vacuum pump – either diffusion / turbo molecular type with air pumping speed of 8000 litres per second - capable of generating and holding at least 1×10^{-4} millibar along with a supporting initial roughing mechanical pump/s (to generate rough vacuum of the order of 1×10^{-2} millibar) prior to high vacuum pumping, and necessary instrumentation for vacuum reading, automatic valves and a control panel for change over from low vacuum pump to high vacuum pump mounted on a single frame.

2.0 SPECIFICATION :

Sl. No.	Description	BHEL Requirement	BIDDER's COMMENT
2.1	Areas of Application	For use in creating High Vacuum in vessels and chambers. This Vacuum generation is a prerequisite for carrying out vacuum type 'Helium Leak Test' of welds and covers in the fabrication of Pressure Vessels, Heat Exchangers and Steam Generators. Generally, jobs are of cylindrical shell / spherical type, made of carbon steel / alloy steel and stainless steel materials with attachments and nozzles.	
2.2	Principle of Operation	Two stage pumping to be provided Stage 1: Atmospheric pressure to around 1×10^{-2} millibar using mechanical pump/s and Stage 2: From around 1×10^{-2} millibar up to 1×10^{-4} millibar or better using diffusion / turbo molecular pumping Even, if oil pumps are used, the vacuum portion should be maintained at fully	

		dried condition.	
2.3	Operating parameters	Ultimate vacuum of 1×10^{-4} millibar or better for job. (Offered system must have ultimate vacuum pressure of 1×10^{-7} millibar or better) The pumps shall be chosen in such a way that a representative volume of 55000 litres to 60000 litres could get evacuated to 1×10^{-4} millibar or better in a reasonable period of time – i.e. within 18-20 hours. To achieve this, as a pre-requisite, rough vacuum in the order of 1×10^{-2} millibar is to be obtained in 12-14 hours in vessels of volume of 55000-60000 litres. This feature has to be backed up by data in the form of pump down curves / actual testing record by evacuating similar volumes.	
2.4	System Configuration	The High Vacuum pumping System has to be supplied as a single system containing: a) Set of One/Two/Three mechanical pumps initially – either Rotary Vane Vacuum Pumps or combination of rotary and root pumps or any other suitable mechanical pump combinations for initial roughing vacuum generation (in the range of 1×10^{-2} millibar) and b) Further high vacuum generation using Oil Diffusion Pump or turbo molecular pump.	
3.0	MECHANICAL PUMP CONFIGURATION		
3.1	Principle of operation	Rotary vane pump or a combination of rotary and root pumps/equivalent	
3.2	No. of stages	Single or multiple	
3.3	Normal pumping capacity	100 cub.m or higher	
3.4	Ultimate total pressure	In the order of 1×10^{-2} mbar with out gas ballast. (This pressure must be within permissible initial vacuum pressure range of the diffusion pump)	

3.5	Operating range	Atmospheric pressure to ^{around} 1×10^{-2} mbar	
3.6	Permissible initial vacuum pressure	Atmospheric pressure	
3.7	Motor	3-Phase motor, 415V, 50 Hz (As per international norms) (Supplier to confirm the details).	
3.8	Connections, Intake , Bellows and Exhaust-DN	Preferably 40NB OR more. Vendor to specify	
3.9	Noise level without gas ballast - dB	As per international norms	
3.10	Admissible ambient temperature - Deg. C	15° to 45°C	
4.0	DIFFUSION/TURBO MOLECULAR PUMP CONFIGURATION		
4.1	Principle of operation	Diffusion/turbo molecular	
4.2	No. of stages	Single or multiple	
4.3	Normal pumping capacity of air below 1×10^{-4} mbar	8000 litres/sec	
4.4	Ultimate total pressure	1×10^{-7} mbar	
4.5	Operating range	1×10^{-2} mbar to 1×10^{-7} mbar	
4.6	Permissible initial vacuum pressure	1×10^{-1} mbar. This must be compatible to the offered mechanical pump.	
4.7	Motor	3-Phase motor, 415V, 50 Hz (As per international norms) (Supplier to specify the details).	
4.8	Heating coil, power, number of cooling circuits and cooling water connection	As per relevant standards	
4.9	Heat up time	Less than 20 minutes	
4.10	High vacuum/fore vacuum	Must be compatible with mechanical pump outlet. Preferably 300NB /350NB/	

	connection	400NB / 63 ISO-K . vendor to specify	
5.0	PORTABLE FRAME		
5.1	Design	A portable frame carrying the entire vacuum system and controls namely Mechanical and diffuser/molecular pumps, Operator Panel, Vacuum gauges and recorders etc to be provided	
5.2	Lifting arrangement	The frame should have lifting hooks at geometrically balanced locations to lift it by using crane hooks while transporting.	
5.3	Wheels	Suitable wheel for moving the entire frame for short distances to be provided. The wheels should be preferable swiveling type and must have locking arrangement.	
5.4	Frame Material	Quality steel sections and plates shall be used for fabrication of Frame. It should be able to withstand pump vibration and easy to handle. Movement of the equipment along with the frame should not pose any difficulty. Preferably Stainless steel material shall be used for cooler section and frame construction.	
5.5	Surface Cleaning & painting	All steel parts are to be shot blasted or chemically treated for surface cleaning, after completion of all operations but prior to painting.	
6.0	OPERATOR PANEL: Operator panel for operating pumps and other safety devices etc. to be provided. The operator panel must consist all the controls, indicators, emergency switches/knobs etc that are required for doing the operation. Operator panel and switches to be placed in ergonomics way in the portable frame.		

7.0	VACUUM GAUGE/INDICATORS/RECORDERS: • Vacuum recording shall be done at two places (one near the pump / within the pump and another near the job connecting point). • Suitable electronic sensors and gauges to be provided for recording at both places simultaneously. • Also, on the portable frame, there should be provisions for vacuum recording using a vacuum head and meter (both low and high vacuum can be read by a single head and meter set or separately by one set for low vacuum and one set for high vacuum). • The heads and meters shall be calibrated ones with calibration standards traceable to national/ International standards. • Distance between job & pump will be about 40 m. Vendor to provide necessary cables suitable for this length. • Pressure Range 1×10^{-7} millibar to atmospheric pressure – either in single set or in dual set. The measurement signals are to be transmitted over a long distances without any problems.	
8.0	COOLING AND FILTERING ARRANGEMENT Exhaust oil filter to filter oil vapour entering the vacuum volume and thus maintaining job surfaces contaminant free to be provided. Exhaust oil system should be provided with cooling arrangement to avoid over heating .The cooling could be achieved using water or equivalent means.	
9.0	MANDATORY FEATURES	
9.1	Automatic Operation control • The equipment must be operated by a single switch • Necessary automatic controls shall be provided for smooth change over from one pump to next pump (roughing cycle to high vacuum cycle) by automatic opening and closing of relevant valves based on vacuum sensing. • Valves provided shall be of automatic and sophisticated with state of art technology like air operated / solenoid operated by sensing the vacuum in the job. Alternately, program logic control shall be in-built for the operation of valves and pumps. The control panel should have provisions like switch displays / buttons /	

		knobs / indications with suitable identifications for the operation of valves and pumps.	
9.2	Vacuum Holding provision during Power interruption	In case of power cut/interruption, immediately, the relevant valves / systems shall operate automatically so that the generated vacuum in the vessel (job) will not get reduced. A good setup for vacuum holding in power cuts by means of suitable inter-locks is to be provided.	
9.3	Vent valve / Vacuum release valve	a) There should be a provision of vacuum release valve or air admittance valve or vent valve operated by a separate switch or program logic. b) The exhaust end of this valve should have a port connection size 20NB/25NB/40NB/50NB (any one of these). Vendor to specify c) Necessary covers, 'O'-rings and clamps (include spares for 3 years) shall also be supplied for this port such that the port/valve will be closed/opened manually as per the requirement. d) This port will be connected to the Helium leak detector for leak detection. While connecting the leak detector through this port and opening this valve, all other valves should get closed and there should not be any pumping out from the job or in other words, the job should get isolated from vacuum pump and the leaking helium from the job to the vacuum side of the job should flow directly and completely to the leak detector (without getting pumped out).	
9.4	Simultaneous functioning	Whenever required, the supplied vacuum pump has to work in parallel with other similar vacuum pumps (could be fully manual versions or automatic versions) while evacuating very large volumes (over 75000 litres) in order to complete the high vacuum achievement faster (with in 12 hrs).	
9.5	Fault indication features	It is very much desirable to have 'fault indication features' with the equipment/system to indicate the nature of problem / break down by means of suitable display / signal.	
9.6	Ports required in the pump	• The main port to connect the job shall be of 300NB / 350NB / 400NB (any one of these) and for this also, necessary 'O' rings and clamps / fasteners	

		are to be included in the basic supply. Suitable additions / spares may be provided for these items to take care of 3 years of trouble free operation and maintenance. Vendor to specify port type. • In addition to main port and an opening with vent valve(as explained in clause 9.3), 4 numbers of small ports are to be provided at the inlet of the pump for making gauge or other required connections for Helium leak testing. Required port size are 20NB, 25NB, 40NB, 50NB. For these also, 'O' rings and clamps / quick turn couplings with spares for 3 years shall be provided. • For all the ports (including main port), suitable covers shall be provided. • An ideal upper portion of the pump (i.e inlet chamber connecting pump and job) shall be of pipe type with openings for smaller ports, and the main pipe's ends connecting the job at one end and pump at other end. • It is preferred that a flexible bellow be provided at the main port (inlet end of the vacuum pump) to accommodate the slight difference in elevation or location of the conduit (pipe) connecting to the job. Necessary 'O' rings and clamps / fasteners are to be included in the basic supply for connecting the bellow with pumps' main port and job. • Job inlet port height to be considered as 5m for providing all bellows, pipe etc	
10.0	CONSUMABLES, SPARES AND ACCESSORIES - Description & Quantity required (supplier to give guidance. Also, consider all the above mentioned points wherever spares requirements are identified)	The offer shall include the necessary list of spares for the smooth operation and maintenance of the equipment for the next 3 years. Optional accessories to be furnished separately. This is to cover supply of Electrical, Electronic & Mechanical Spares / panel boards – Both for operation and maintenance for a period of 3 years. Complete List of Spares – both Mechanical & Electrical - including • Control-Transformers • All types of Printed Circuit Boards • Critical Spares for solenoid coil and valves	

		• vacuum heads and vacuum meters • service tool kit • All Signal Cables - 1 No. each • All Fuses – 3 Sets. • set of oils, clamps, quick turn couplings, 'o' rings & seals • Cooling Fan • Pump • Drive Belts • End Connectors • software copy If any • Control unit with backup program/software if any and all other essential spares to be compulsorily LISTED and QUOTED ITEMWISE	
11.0	DOCUMENTATION IN ENGLISH LANGUAGE	Separate Operational Instructions & Maintenance Manual (In English Language) shall be given: The O & M Manual shall contain the following details : - a)Operation Instructions - b)Description & Constructional Details - c)Mechanical Assembly Drawings - d)Part Drawings - e)Electrical Schematic Drawings & Circuit Diagrams - f)Bill of Materials - g)Printed Circuit Board Schematics - h)Technical Leaflets of Bought-Out Items - i)List of Spare Parts (Both Electrical & Mechanical) with Make, Specifications/Ratings - j)Trouble Shooting Details - k)Safety Instructions – For Erection, Operation and Maintenance.	

		No of Copies : Hard Copies in Original -3 Sets Soft Copy in CD/DVD/Pendrive -1 No	
11.1	Quality Records along with equipment	Performance / functional test reports shall be given both for equipment and accessories. For vacuum heads and meters, relevant calibration certificates shall be issued.	
12.0	POWER INPUT	415V $\pm$ 10%, 50 HZ $\pm$ 3 HZ, 3 Phase AC (3 wire system with out neutral) Power Supply will be provided by BHEL at a single point. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Suitable power cable of 10m length to be provided	
13.0	PRE DISPATCH INSPECTION: Vendor to give PDI call to BHEL before dispatch. The following Schedule of Inspection is to be carried out, prior to dispatch from the Supplier's Works :		
13.1	Certificates	Test Reports and calibration certificates for vacuum heads and meters.	
13.2	Performance prove out test at the time of PDI	The supplier has to prove out in a test for demonstrating the satisfactory holding of vacuum generated at the level of Ultimate vacuum (1×10^{-7} millibar) for at least 3 hours when the vacuum pump is isolated (no pumping out). This record certifies the leak tightness of pump seals, joints, materials and connections along with proper suitability of materials (including oils without allowing fumes into the evacuated volume) for high vacuum utilization without problems like gas release tendencies in high vacuum. (OR) Helium leak test shall be conducted for the demonstration of reliable performance of the pump against the acceptance criteria of 1×10^{-7} Std CC/sec of Helium in the hood type vacuum test. The same test (vacuum hold / Helium leak test) has to be repeated at our works during the equipment commissioning.	
14.0	COMMISSIONING AT BHEL	Erection and commissioning shall be done by the supplier at BHEL Trichy. After the installation, the supplier has to run the equipment and demonstrate its performance at BHEL works including vacuum generation and vacuum holding	

14.1	Performance prove out at BHEL	The supplier has to prove out in a test for demonstrating the satisfactory holding of vacuum generated at the level of Ultimate vacuum (1×10^{-7} millibar) for at least 3 hours when the vacuum pump is isolated (no pumping out). This record certifies the leak tightness of pump seals, joints, materials and connections along with proper suitability of materials (including oils without allowing fumes into the evacuated volume) for high vacuum utilization without problems like gas release tendencies in high vacuum. (OR) Helium leak test shall be conducted for the demonstration of reliable performance of the pump against the acceptance criteria of 1×10^{-7} Std CC/sec of Helium in the hood type vacuum test. The same test (vacuum hold / Helium leak test) has to be repeated at our works during the equipment commissioning.	
14.2	Training at BHEL/Trichy	Training on Operation and Maintenance for BHEL Staff – at least for 1 week during the commissioning and prove-out of the equipment.	
14.3	Guarantee	The Performance of the Vacuum pump in Total and the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of 12 months from the date of performance acceptance / successful commissioning at BHEL Works.	
15.0 GENERAL FEATURES AND CONDITIONS			
15.1	Design Base	Supplier to indicate the details including codes / standards adopted. Performance curves are to be added.	
15.2	Noise Level	Must adopt the applicable norms. Vendor to indicate the noise level of the offered system	
15.3	Working Environment	Indoor Working Environment with temperature up to 45°C and Humidity up to 85%, but both may not be occurring simultaneously. The offered equipment shall be suitable for these tropical condition.	
15.4	Exhaust Filters	Filtering the exhaust air from entrained lubricant particles / oil fumes extraction.	
15.5	Monitoring Instruments	Water flow monitors (in case of diffusion pumps) are to be installed in cooling water return section of the diffusion pump. When the cooling water drops below	

		certain level / flow reduces, either the heater in the diffusion pump has to be switched off automatically or warning light or signal is to be triggered. Over-Temperature protection Switch (in case of diffusion pumps) are to be installed to monitor the temperature of the cooling water in the cooling water circuit of the Diffusion pump. When the temperature rises to unacceptable high levels, the heater in the Diffusion pump is to be switched off. In case of turbo molecular type version also, similar monitoring devices for equipment safety shall be provided in a suitable manner.	
15.6	Quality Valves	There should be no vibrations when the valves are opened or closed. Valves should be of state of art technology to hold high vacuum / of Helium leak tight quality.	
15.7	Service Support Requirements.	Vendor shall ensure AMC service facilities in India after the guarantee period, through trained service personnel in India for next 5 years as and when need arise. Spares to be made available within 1 week. However BHEL reserves the right to place/ Not to place AMC order after the Guarantee period.	
16.0	MANDATORY DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:		
16.1	GA drg	- Complete GA drawing indicating the frame, location of the pumps and other accessories etc on the frame with over all dimensions of the equipment - GA Drawing and specifications of the Rotary Vane Vacuum Pump /mechanical pump. - GA Drawing and specifications of Oil Diffusion Pump / turbo molecular pump. - GA Drawing and specifications of Electric / Electronic systems and control panels and other mechanical systems. Drawings and specifications for vacuum gauges and heads. - Wiring Diagram with Logic Circuits, if any. - Complete valves, their specifications and proposed location in the system	

16.2	Make and model no	Make and model no of the mechanical pump, Diffusion/Molecular pump, Motors, Valves, Gauges, Indicators etc offered for this enquiry	
16.3	Weight	Weight of the Equipment with frame is to be indicated by the supplier.	