An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

ENQUIRY	Phone: +91 431 257 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620900028	**28.01.2009**	**02.03.2009**
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	Vacuum pump as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 No.	25.08.2009

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 "2620900028".

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** Sr.Manager / MM / Capital Equipment

PART A

VACUUM PUMP

SECTION – I QUALIFYING CRITERIA

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer.

S. No.	REQUIREMENTS	VENDOR's COMMENTS
1.0	The BIDDER / VENDOR shall have a minimum of FIVE Years of Continuous Experience in the Design, Manufacture & Supply of high vacuum pumps. Kindly indicate the actual experience.	
2.0	The BIDDER / VENDOR shall have supplied at least one number of HIGH VACUUM PUMP OF THIS CAPACITY in the last 5 years. Kindly confirm and indicate the number of equipments (quoted model) sold in 2005/08 in the world.	
3.0	The bidding FIRM should have 'in-house' or 'self-owned' facility for FABRICATION and TESTING at the rated capacity.	
4.0	Reference List of Customers and Performance Certificates from CUSTOMERS (minimum 2 Customers) with full contact details of CONTACT PERSON.	
5.0	The BIDDER / VENDOR should have sound financial position and should furnish the Finance Statements (Summary of P & L Statement and Balance Sheet) for the immediate past three years.	
6.0	In case of short listing by the Purchaser in the process of vendor assessment, the BIDDER / VENDOR has to co-ordinate for the visit of Assessing Team, to the WORKS of the BIDDER / VENDOR with a notice period of 10 Days.	

SECTION – II

The BIDDER / VENDOR has 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.	PARTICULARS	VENDOR's RESPONSE
7.0	Number of Years of Experience of the BIDDER/ VENDOR in the field of manufacturing and supplying "HIGH VACUUM PUMPS"	
8.0	Number of HIGH VACUUM PUMPS supplied, erected & commissioned till date in the following category A) Up to 3000 LITRES PER SECOND B) Above 3000 LITRES PER SECOND The discharge rate mentioned above is for high vacuum pump. Before going for high vacuum, a compatible mechanical pump should generate vacuum in the level of 10^{-2} mbar and bidder has to furnish the complete details of these supplied versions .	
9.0	Year of launch of the Model quoted against this Enquiry	
10.0	Number of HIGH VACUUM PUMPS (along with back up mechanical pumps – as a pumping station) supplied, erected & commissioned till date for the different applications / customers.	

11.0	Details of Design Set-Up / Codes and Standards used.	
12.0	Details on International standards followed in Design of the Equipment (including analysis methodology and verification of equipment). Calibration standards of vacuum heads and meters and their traceability to international standards. Details regarding periodic recalibration and sources / tie-ups for such recalibrations including the proposed cost of calibration and lead time for calibration.	
13.0	Comprehensive Details on performance Testing - of the Equipment quoted.(Supplier should have conducted a prove out performance test using the equipment or gathered data from users on the equipment performance. The expected information is 'pump down curve' in typical volumes in the range of 30000 litres – 50000 litres. Data is of the form, time versus vacuum readings when the pump starts evacuating from atmospheric pressure up to vacuum levels lower than $1x10^{-4}$millibar (in chambers of volume 30000 – 50000 litres). Idle (without running the pump) vacuum holding at the above mentioned level at least for 3 hours should have been carried out.)	PERFORMANCE VALIDATION IS TO BE CONFIRMED BY THE SUPPLIER.
14.0	Details on manufacturing facilities – machining, forming, welding and heat treatment, material control with regard to its specialization like high vacuum capability, non destructive testing and final functional and proof testing facilities for this pump. Details on selection of materials for suitability in high vacuum service – to have evidences on satisfactory performance of used materials regarding out gassing, baking, etc. Stages of Internal Inspection and Inspection by External Agencies [other than Customer Inspection]	
15.0	Details of Electrical/Electronic Control Panel Manufacturing and Testing Facilities.	

SECTION – III

The BIDDER / VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser:

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
16.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical & Commercial and Price Bid. The Technical Offer shall be in line with the BHEL Technical Specifications and the Guidelines or Annexures mentioned, wherever applicable.	
17.0	The Technical Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause of the specifications.	
18.0	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.	
19.0	The Technical Offer shall be supported by Product Catalogue, drawings, manuals and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria. This should include operational and maintenance spares also.	
20.0	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	
21.0	The reference List of Customers shall be accompanied with the details (Phone Number/E-Mail ID) of the CONTACT PERSON for cross reference	

PART B

To carry out helium leak test of vessels, diffusion / turbo molecular pump 3000 litres per sec.1x10^{-4} millibar vacuum & instrumentation mounted on a common skid.

1.0 BRIEF DESCRIPTION :

HIGH VACUUM PUMP. It is a Pumping station Consisting of an High vacuum pump – either diffusion / turbo molecular type of minimum 3000 litres per second - capable of generating and holding at least 1x10^{-4}millibar along with a supporting initial roughing mechanical pump (to generate rough vacuum of the order 1x10^{-2}millibar prior to high vacuum pumping as start up vacuum 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 common skid.

2.0 SPECIFICATION :

Sl No	BHEL Requirement	Description of expectations from the Offer
2.1	Areas of Application in BHEL/Trichy & Equipment requirements	• For use in creating High Vacuum in vessels and chambers and this Vacuum generation is a pre-requisite 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 and made of carbon steel / alloy steel and stainless steel materials with attachments and nozzles.
2.2	Principle of Operation	• Two stage pumping – Atmospheric pressure to 1x10^{-2}millibar using a mechanical pump and then up to 1x10^{-4}millibar or better using diffusion / turbo molecular pumping (of 3000 litres per second minimum). Even, if oil pumps are used, the vacuum portion should be maintained at fully dried condition.
2.3	Operating parameters	• Ultimate vacuum of 1X10^{-4}millibar or better within 16-20 hours in a volume of 30000-50000 litres.
2.4	System Configuration with name of subsystems involved, details of pumps.	• The High Vacuum pumping System has to be supplied in single unit containing Rotary Vane Vacuum Pump or any other suitable mechanical pump for initial roughing vacuum generation (in the range of 1x10^{-2}millibar) and further high • vacuum generation using Oil Diffusion Pump or

		turbo molecular pump. The capacity of roughing pump shall be in the range of 50-100m^3/hour and that of diffusion / turbo molecular pump shall be 3000 litres per second minimum. Both roughing and high vacuum pumps shall be of single or multi stage. The required high vacuum level after diffusion / turbo molecular pumping is $1x10^{-4}$millibar or better. The pumps shall be so chosen (combination of pumps) in such a way that a representative volume of 30000 litres to 50000 litres could get evacuated to $1x10^{-4}$millibar or better in a reasonable period of time – i.e. within 16-20 hours. This feature has to be backed up by data in the form of pump down curves / actual testing record by evacuating similar volumes. **If needed, the supplied vacuum pump has to work in tandem with other similar vacuum pumps (could be fully manual versions or automatic versions) while evacuating very large volumes (over 75 cubic meter) in order to complete the high vacuum achievement faster (within 12 hrs).**
2.5	Cooling and Filtering arrangement	• Pumping station should be provided with cooling arrangement (the cooling could be using water or any other means) –to avoid overheating, Exhaust oil filter-to filter oil vapours entering the vacuum volume and thus the job surfaces will be contaminant free, Switch panel for operating pumps and other safety devices etc., in one movable frame or skid. The frame / skid should house all the items (including pumps) with good convenience for easy operation of relevant knobs/levers/switches.
2.6	Vacuum reading facility	• Also, on the frame, there should be provisions for vacuum recording using a vacuum head and meter (both low and high vacuum can be read by 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 International standards. Vacuum recording shall be at two levels (one near the pump / with in the pump and one near the job connecting point).
	Self diagnostic	• It is very much desirable to have 'self diagnostic

2.7	features	features' with the equipment/system to indicate the nature of problem / break down by means of suitable display / signal.
2.8	Operation control	• Suitable automatic controls shall be there 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. The equipment shall be operated by single switch only and further operation of relevant pumps shall be automatic based on sensing vacuum level. The valves also shall be of automatic and sophisticated ones 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. In case of power cut, immediately, the relevant valves / systems shall operate 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.
2.9	Vent valve / Vacuum release valve	• There should be a provision of vacuum release valve or air admittance valve or vent valve operated by a separate switch or program logic and the exhaust end of this valve should have a port connection size 20NB/25NB/40NB. **Necessary covers, o-rings and clamps (include spares for 3 years) shall also be supplied for this port.** 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).

2.10	Ports required in the pump	• The main port to connect the job shall be of 200NB / 250NB/300NB and necessary 'o' rings and clamps / fasteners are to be included in the basic supply. **Suitable additions may be provided for these items to take care of 3 years of trouble free operation and maintenance.** In addition to main port and a opening with vent valve, small ports 4 numbers are to be provided at the inlet of the pump for making connections for Helium leak testing. Required port size = 20NB/25NB/40NB. **For this 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 (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. This chamber has to be a part of equipment supply.
2,11	Electrical Requirements	• The equipment shall be capable of working with Electric Input Power through a 3 Phase AC, 415 $\pm$ 10% V, 50 $\pm$ 2% Hz, 3 Wire System with 4^{th} Wire for Protective earthing.
2.12	Performance prove out test (Supplier to give complete details)	• The supplier has to prove out in a test for demonstrating the satisfactory holding of vacuum generated at the level of $1x10^{-4}$millibar or better 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. Alternately, Helium leak test shall be conducted for the demonstration of reliable performance of the pump against the acceptance criteria of $1x10^{-7}$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.
2.13	Design Base	• Supplier to indicate the details including codes /

			standards adopted. Performance curves are to be added.
2.14	Scope of Supply - clear in all respects Design & Manufacture	a.	Detailed Design, Manufacture and supply as per our BHEL specifications**.** In case more than one type of pump is recommended for the same application, the supplier shall give separate quotes.
2.14.1	Assembly & Testing	b.	Assembly and Testing before Despatch. Pre-despatch inspection and functional prove out tests will be witnessed by BHEL.
2.14.2	Consumables, Spares and Accessories - Description & Quantity required (supplier to give guidance. Also, consider all the above mentioned points wherever spares requirements are identified)	c.	The offer shall include the necessary list of spares for the smooth operation and maintenance of the equipment for the next 3 years minimum. This should be part of the scope of supply. 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. (include oils, clamps, quick turn couplings, 'o' rings & seals also). Standard accessories like spare vacuum heads and vacuum meters with cables, shall be supplied along with the equipment for 3 years of operation..
2.14.3	Erection & Commissioning & Performance prove out at BHEL	d.	Erection and commissioning shall be done by the supplier free of cost. After the installation, the supplier has to run the equipment and demonstrate its performance at BHEL works including vacuum generation and vacuum holding or Helium leak test Required support during installation, commissioning and performance prove out test will be provided by BHEL. Leak detector for Helium leak test or suitable facilities for vacuum holding test will be provided by BHEL based on details requested by supplier.
2.14.4	Training on Operation & Maintenance for BHEL Staff at BHEL/Trichy	e.	Training on Operation and Maintenance for BHEL Staff – at least for 1 week after the successful commissioning and prove-out of the equipment**.** This shall be given free of cost by the supplier .
2.14.5	Guarantee	f.	Performance Guarantee for 24 months, from the date of commissioning. Free service during

		Guarantee period shall be provided.
2.14.6	Maintenance Aspects - Trouble Shooting & Documentation	g. Manuals - Operating & Maintenance manuals, Engineering drawings, Circuit diagrams, PCB drawings, etc shall be given for main equipment and accessories – hard copy required in English only. (Both in soft form and hard form). Catalogues / photos / video clips of the model are to be provided.
2.14.7	Quality records.	h. Verification of Test Certificate for Raw Materials & Bought-Out Items used. Performance / functional test reports shall be given both for equipment and accessories. For vacuum heads and meters, relevant calibration certificates shall be issued. .
2.14.8	Service Support Requirements.	• Vendor shall ensure AMC service facilities in India after the guarantee period, through trained service personnel in India

3.0 Mechanical pump – Desirable requirements		
S.No.	**PARTICULARS**	**BHEL SPECIFICATIONS for Rotary Vane Vacuum Pump /Any other type of mechanical pump**
3.1	Normal pumping speed-50Hz in One/Two stages	50 – 100 CUBIC METER PER HOUR
3.2	Ultimate total pressure without gas ballast- mbar	10^{-2} millibar
3.3	Noise level without gas ballast - dB	As per international norms
3.4	Admissible ambient temperature - Deg.C	12 to 50 Deg.C
3.5	Motor rating& Type of protection.	3-Phase motor, 440V,50 Hz (As per international norms) (Supplier to confirm the details).

4.0 High Vacuum pump– Desirable requirements		
S.No.	**PARTICULARS**	**BHEL SPECIFICATIONS for Oil Diffusion Pump /**

		TURBO MOLECULAR PUMP
4.1	High vacuum/fore vacuum connection	200NB OR 250NB OR 300NB / 63 ISO-K
4.2	Pumping Speed for air below 1 x 10^{-4} millibar	3000 LITRES PER SECOND minimum
4.3	Operating range - mbar	10^{-2} to 10^{-4} millibar or better. As a pumping station holding at 1X10^{-4}millibar is to be ensured.
4.4	Ultimate Total Pressure	10^{-4} millibar or better
4.5	Max. permissible fore vacuum pressure-mbar	10^{-1}millibar
4.6	Heating coil, power, Number of cooling circuits and cooling water connection	As per relevant standards
4.7	Heat up time	Less than 20 minutes
5.0 GENERAL FEATURES AND CONDITIONS		
5.1	Exhaust Filters	Filtering the exhaust air from entrained lubricant particles / oil fumes extraction.
5.2	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 unacceptably high levels, the heater in the Diffusion pump is to be switched off. In case of turbo molecular type version also, such tell-tale monitoring devices for equipment safety shall be provided in a suitable manner.
5.3	Vacuum Gauges-heads and meters with associated cables.	Pressure Range 1 x 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.
5.4	Quality Valves	There should be no vibrations when the valves are opened or closed. Valves should be of state of art quality to hold high vacuum / of Helium leak tight quality.
5.5	Electric Power Input	Electric Input Power through a 3 Phase AC, 415 ± 10% V, 50 ± 2% Hz, 3 Wire System with 4th Wire-Protective earthing
5.6	Ambient Condition	Indoor Working Environment with temperature upto 50 ° C and Humidity up to 85 %, but both may not be occurring

		simultaneously. Hence, the offered equipment shall be of tropicalised in design.
5.7	Frame	Certified steel plates shall be used for fabrication of Frame. It should be able to withstand pump vibration and easy to handle and movement of the equipment along with the frame should not pose any difficulty.
5.8	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.
5.9	Dimensions	BIDDER has to indicate the tentative dimensions for the Base Frame along with the equipment. This feed back is needed to check for the operational suitability at BHEL Works.
5.10	Electrical and Electronic Spares	BIDDER has to list down with a separate quote, the Electrical and Electronic spares for trouble free operation of the pump in three shifts, for a period of three years.
5.11	Mechanical Spares	BIDDER has to Recommend& quote separately, the list of Mechanical Parts which are to be procured as spares for trouble free operation of the pump in three shifts, for a period of three years.
5.12	Drawings and Documents	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. Weight of the Equipment with frame is to be indicated by the supplier.
5.13	Inspection	The following Schedule of Inspection is to be carried out, prior to dispatch from the Supplier's Works : a. Verification of Test Certificates for Raw Materials & Bought-Out Items used. b. Prove out Test reports for ultimate vacuum level, time to reach the vacuum in the given volume and its holding capability for 3 hours. (on mutually agreed norms). c. Test Reports and calibration certificates for vacuum heads and meters.
5.14	Commissioning	Commissioning of the vacuum pump and Performance Prove –Out for Capacity and Smooth Functioning (at BHEL Works) shall be the responsibility of the supplier.

		This includes vacuum generation within the time as per the volume of the vessel and holding of vacuum for 3 hours or Helium leak test.
5.15	O & M Manuals	Equipment shall be provided with 3 hard copies and 1 soft Copy of Erection/Assembly, Operation & Maintenance Manuals, containing the following technical details . -General Arrangement Drawings & specifications of pumps, systems, spares and vacuum indicators. -Electrical Wiring Schematics. -Detailed Wiring Diagrams. -Control Panels and Remote Control, if any. Specifications / Ratings of Bought-Out Items Warranty Card for all Bought-Out Items Trouble Shooting Chart for all Sub-Systems
5.16	Performance 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 24 months from the date of performance acceptance / successful commissioning at BHEL Works.