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:**
	2620900068	**04.03.2009**	**06.04.2009**
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	Ultrasonic Imaging System as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 No.	31.08.2009

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 "2620900068".

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

Qualifying Criteria for Supply of 'Ultrasonic imaging system with TOFD facility'

S. No.	PARTICULARS	VENDOR's RESPONSE
1.0	Number of Years of Experience of the BIDDER/ VENDOR in the field of design, manufacture and supply of 'Ultrasonic Imaging system with TOFD facility'	
2.0	YEAR of LAUNCH of the Model quoted against this ENQUIRY	
3.0	Is there any other model launched after the quoted Model? Otherwise, indicate the likely year in which the next model is likely to be launched	
4.0	Number of 'Ultrasonic Imaging systems with TOFD facility' supplied, installed and commissioned till date, in the QUOTED MODEL	
5.0	Number of 'Ultrasonic Imaging systems with TOFD facility' supplied, installed and commissioned till date for the following category of CUSTOMERS (within INDIA): a) Government Organisations b) Private Sector Companies [Large Scale Industries]	
6.0	Number of 'Ultrasonic Imaging systems with TOFD facility' supplied, installed & commissioned till date in the following Category (around the GLOBE) : a) Universities b) R&D Labs c) Reputed Heavy Engineering Works/Manufacturing firms	
7.0	Details of Design Set-Up and Technology Back-Up assured for the PRINCIPAL Equipment Maker	
8.0	Details on International Standards followed in Design of the System	
9.0	Comprehensive Details on Performance Testing - of the Equipment quoted, to be ensured, prior to dispatch from Supplier's Works	
10.0	Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed)	
11.0	Details on SERVICE-after-SALES Set-Up in India including the addresses of Agents/Service Centres in India and Asia	
12.0	Any Additional Data to supplement the manufacturing capability of the BIDDER	

SECTION – II

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for the Ultrasonic Imaging System with TOFD facility.

S. No.	REQUIREMENTS	VENDOR's COMMENTS
13.0	The BIDDER / VENDOR shall have a minimum of TWO Years of Continuous Experience in the Design, Manufacture of **'**Ultrasonic Imaging system with TOFD facility'. Indicate the actual experience.	
14.0	The BIDDER / VENDOR shall have supplied at least one number of **'**Ultrasonic Imaging system with TOFD facility within the last five years. Indicate the number of equipment (of QUOTED MODEL) sold .	
15.0	Reference List of Customers and Performance Certificate from CUSTOMERS (minimum ONE Customer) with full contact details of CONTACT PERSON.	

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 **[with PART A & PART B]** & Commercial and Price Bid.	
17.0	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. 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.	
18.0	The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for FIVE Years, from the date of commissioning of the equipment at BHEL Works.	
19.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria	
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 of Scope of Supply.	
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 by BHEL	

TECHNICAL SPECIFICATIONS FOR ULTRASONIC IMAGING SYSTEM WITH TOFD FACILITY

Sl.No.	Particulars		Bidder's offer
1.0	Description of the Ultrasonic Imaging System	Portable Multi-Channel Combined Time of Flight Diffraction Technique(TOFD) and Pulse Echo Ultrasonic Weld Inspection and Recording system with Automatic Smart Scanner, and Probes for Ultrasonic Evaluation of Longitudinal / Circumferential/Fillet weldments in Steel Pressure vessels, Heat Exchangers, and Pipes .	
2.0	Area of application	Ultrasonic Examination for detection of planar / volumetric defects of Cir seams in Pressure vessels/Heat Exchangers with OD ranging from 900mm to 3500mm and thickness 50mm-200mm, Long Seams in Pressure vessels of OD ,900mm to 1800mm(inclusive of Bi-thickness shells),and Pipe Circ seam welds OD 400mm to 900mm and thickness 30mm-70mm.	
3.0	Principle of operation	Combination of Pulse echo contact method, with Time Of Flight Diffraction (TOFD) Technique.	
4.0	System capability	The system shall conform to the following International Standards. ASME Section I , Section III, Section VIII Division 1&2,and **ASME Code Case 2235 Rev 9 – Use of Ultrasonic Examination in Lieu of Radiography.** ▪ Non-Destructive Examination of Welded Joints – Ultrasonic Examination of Welded Joints. – British and European Standard BS EN 1714:1998 ▪ Non-Destructive Examination of Welds – Ultrasonic Examination – Characterization of Indications in Welds. – British and European Standard BS EN 1713:1998 ▪ Calibration and Setting-Up of the Ultrasonic Time of Flight Diffraction (TOFD) Technique for the Detection, Location and Sizing of Flaws. – British Standard BS 7706:1993 ▪ WI 00121377, Welding – Use Of Time-Of-Flight Diffraction Technique (TOFD) For Testing Of Welds. – European Committee for Standardization – Document # CEN/TC 121/SC 5/WG 2 N 146, issued Feb, 12, 2003 ▪ Non-Destructive Testing – Ultrasonic Examination – Part 5: Characterization and Sizing of Discontinuities. – British and European Standard BS EN 583-5:2001 ▪ Non-Destructive Testing – Ultrasonic Examination – Part 2: Sensitivity and Range Setting. – British and European Standard BS EN 583-2:2001 ▪ Manufacture and Testing of Pressure Vessels. Non-Destructive Testing of Welded Joints. Minimum Requirement for Non-Destructive Testing Methods – Appendix 1 to AD-Merkblatt HP5/3 (Germany).– Edition July 1989	

5.0	Principle of Operation	Multi-Channel Pulse Echo Flaw Detection for compression, shear and surface wave inspection through continuous measuring of echo amplitudes and reflectors coordinates along probes trace ,in combination with TOFD inspection -RF-B scan and D-Scan imaging. The combination of time-of-flight diffraction (TOFD) and pulse-echo techniques is applied for the complete inspection in a single scan to cover 100% weld root,cap,and mid wall, and also to reduce the inspection time compared to conventional raster scanning or radiography.	
6.0	Basic Hardware Specification	The system, comprising of an **8-channel system** held in suitable rugged containment designed for the conditions expected in an Industrial Environment.	
6.1	Number of Channels	8 channels	
6.2	Pulsing / Receiving Type	All channels to fire, receive, digitize, and record signals parallelly / Sequentially .Sequential cycles of firing, receiving, digitizing, and recording signals by each channel are to be separated in time in a sequence loop.	
6.3	Pulse type	Preferably Square Wave Pulse - Supplier to specify.	
6.4	Pulse rise	5-10 ns - Supplier to specify.	
6.5	Pulse Voltage	40 V - 300 V - Supplier to specify	
6.6	Pulse width	Preferably 50-1000 ns in 10 ns increments - Supplier to specify	
6.7	Modes	Single / Dual	
6.8	PRF	15-10000 Hz - Supplier to specify	
6.9	Gain	-10dB to110 dB controllable in 0.1 dB resolution - Supplier to specify	
6.10	Frequency Band	0.5-40 MHz Wide Band - Supplier to specify	
6.11	Ultrasound Velocity	300-10000 m/s - Supplier to specify.	
6.12	Range	0.5-7000 µs - Supplier to specify	
6.13	Probe Delay	0 to 70 µs controllable in 0.01µs resolution – expandable	
6.14	Signal Filtering	Low pass,High Pass filters (Channel selectable) - Supplier to specify.	
6.15	Display Modes	A Scan-RF, Rectified (Full Wave / Negative or Positive Half Wave), Signal's Spectrum (FFT Graph).B-Scan,C-Scan,D-Scan - Supplier to specify.	
6.16	Reject	0-99 % of screen height controllable in 1% resolution - Supplier to specify.	
6.17	DAC / TCG	Through sequential recording echo amplitudes from equal reflectors at different depths. - Supplier to specify the details.	
6.18	DAC	DAC Curves – up to 8 DAC Memory - 16kByte DAC Points per Curve Up to 4000. DAC Frequency ¼ to 1/32 of digitisation rate automatically selected depending on range & points.	

6.19	DGS(Optional)	Standard Library for probes - Supplier to specify.	
6.20	Gates	2 Independent Gates - Supplier to specify	
6.21	Gate Start and Width	Controllable over whole range - Supplier to specify	
6.22	Gate Threshold	5-95 % of A-Scan height controllable in 1 % resolution - Supplier to specify	
6.23	Freeze (A-Scans and Spectrum Graphs)	Freeze All – A-Scans and Spectrum Graphs / Freeze Peak – A-Scans / All measurements functions, manipulating Gates, and ±6dB Gain varying option for frozen signals. Otherwise provision to extract A-scans from the collected Data. - Supplier to specify.	
6.24	Digitiser	Sampling Rate 125MHz to 2MHz in 7 steps (250MHz optional) Resolution – At least 8-bit Averaging - 2 to 256 frames .Supplier to specify Averaging Memory –Preferably 128k – dynamically allocated across channels - Supplier to specify.	
6.25	Encoder Interface	Built-in interface for incremental mechanical encoder - Supplier to specify	
6.26	Encoding	Two axis encoder. True-to-location (incremental encoder – 0.5 mm resolution) – for multi channel operation - Supplier to specify	
6.27	Imaging Modes	Cross-sectional B-Scan, Plane View CB-Scan, D-Scan, TOFD - Supplier to specify	
7.0	TOFD	The TOFD technique is based on measurement of the time-of-flight of the ultrasonic waves diffracted from the top and bottom tips of a defect or discontinuity when a longitudinal wave is incident on it. Two wide beam angle probes are used in transmitter-receiver mode. Broad beam probes are used so that the entire inspected area is flooded with ultrasound, concequently the entire volume is inspected using a single scan pass along the weld line.	
8.0	Scanner Motorized	A multi-tasking X-Y coordinate scanner for TOFD imaging combined with Pulse echo testing and C-scan mapping for inspection of welds in pressure vessels, heat exchangers and pipes. The scanner should have • Magnetic wheels for quick setup on ferrous surfaces - Supplier to specify • Scanner tracks to allow the scanner to be used on non-magnetic materials - Supplier to specify • Two stoppers on the arm of the X-axis that define the endpoints of a scan range - Supplier to specify • Provision to Adjust transducer distance - Supplier to specify • The scanners type should be automatically detected by the UT system - Supplier to specify.	

		• Scanner interface ports - Supplier to specify Input type, Motor drive unit interface, Number of axis, Number of limit output, Encoder interface, Temperature inputs, Potentiometer interface, Video input. • Real Time coupling monitoring feature. Also supplier to specify- • Scan range • Scan resolution • TOFD Head length • Pre-amp band width • Pre-amp gain • Scan speed • Scanner controller	
9.0	Standard Length of one Straight Line Scanning record:	Preferably, 50-25000 mm, automatic scrolling - Supplier to specify	
10.0	Image Analysis Software	The Software of the system should have the following capabilities- • Windows applications • Scan plan setup software. • Real-time B-scan and TOFD display • User-drawn weld section with defects for each channel or for each defect type • Recovery and play back of A-Scan sequence at various gain levels. • Echo-dynamic pattern analysis. • Defects sizing, outlining, pattern recognition. • Report format preferably in MS Excel / MS Word /HTML /PDF format. Supplier to specify.	
11.0	Data Reporting	Calibration Dumps, A-Scans, Spectrum Graphs, Thickness Profile B-Scans, cross-sectional B-Scans, plane view CB-Scans, TOFD maps, Should be transferable to any External Computer/External drive and Printer so that Direct printouts can be taken. Gray scale B-scan/D-scan TOFD prints with user-specified scale - Supplier to specify.	
11.1	Data Storage Capacity	At least 100000 sets including calibration dumps accompanied with A-Scans and/or Spectrum Graphs. At least 10000 sets including calibration dumps accompanied with Thickness Profile B-Scans, cross-sectional B-Scans, plane view CB-Scans, TOFD maps, strip charts, and complete sequence of A-Scans captured during scanning.	

12.0	PC/Laptop for Data acquisition and Analysis	On board / External. CPU-Processor speed minimum 1.4GHz.RAM- Minimum 512 MB(upgradable).Hard Disc-Minimum 40GB(upgradable).Display monitor-14'' colour daylight readable, TFT / LCD monitor - Supplier to specify.	
13.0	Flash Memory - Quasi HDD	4 Gigabytes	
14.0	Outputs	LAN, USB X 2, PS 2, SVGA - Supplier to specify	
15.0	Compatibility with the external devices	PS 2 Keyboard and Mouse, USB Keyboard and Mouse, USB Flash Memory card, Printer through USB or LAN, PC through USB or LAN, SVGA External Monitor.	
16.0	Operating System	Windows XP or later versions.	
17.0	Battery Life	2-4 hour operational (6-8hour with extended battery option)	
18.0	Power	Mains - 240 VAC, 50 Hz, auto-switch; Battery 12V up to 6 hours continuous operation.	
19.0	Housing	Supplier to specify	
20.0	Dimensions	Supplier to specify	
21.0	Weight(Excluding scanner)	Preferably less than10kg - Supplier to specify	
22.0	Probes, Wedges	TOFD (longitudinal)probes - 3 pairs,5MHz/10MHz. Shear wave probes of transverse cracks – 2 No.s Shear wave probes for longitudinal root defects – 2 No.s Shear wave probes for longitudinal crown defects –2 No.s Longitudinal wave probes – testing of HAZ – 2No.s Creeping wave probes-2No.s **Note:** ***Supplier to specify the frequency, angle and wedges of probes mentioned above for the weld examination as specified in clause 2.0 to constitute a 8-channel Automatic scanning system.***	
23.0	Cables	Supplier to specify the details of Power cables, Transducer connector cables, Computer connector cables, Scanner cables etc.	
24.0	Scope of Supply	• Multi-Channel Combined Time of Flight Diffraction Technique (TOFD) and Pulse Echo Ultrasonic Weld Inspection and Recording system as per this specification –1No. • 8channel Automatic Motorized Smart Scanner as per the specification for long seam and cir seam. • Probes and wedges-16No.s as per clause 22.0. • Software as per clause 10.of this specification.	
25.0	Performance Prove-Out at BHEL	On supply of the equipment it is essential to demonstrate the satisfactory performance of the system and train the operators for the applications as specified in Cl.2.0	

26.0	Installation and commissioning	The Ultrasonic Imaging system and accessories is to be installed & commissioned at BHEL Works, FREE OF COST, by the SUPPLIER.	
27.0	Documentation in ENGLISH Language	3 Copies (In English) of the Operation & Maintenance Manuals shall be supplied along with the system.	
28.0	Performance Guarantee	The Ultrasonic Imaging system and accessories are to be guaranteed for its performance for a period of two years from the date of commissioning.	
29.0	Service and Spares Support Requirements	Vendor shall ensure after the guarantee period, through trained service personnel in India for next 5 years as and when need arises. Spares to be made available with shortest possible time.	
30.0	Training on Operation & Maintenance	Complete Training on operation & maintenance of the Equipment & Accessories, for minimum one week , is to be given free of cost.	
31.0	Annual Maintenance Contract – AMC	The BIDDER has to QUOTE for AMC with detailed scope of work.	
32.0	Spares for Main Equipment. & Accessories	BIDDER has to list down with a separate quote,the critical SPARES under Mechanical, Electrical & Electronic Category for the Main Equipment & Accessories for Equipment Operation.	