Bharat Heavy Electricals Limited

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

An ISO 9001 Company

ENQUIRY NOTICE INVITING TENDER	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com

Two Part Bid Tender to be submitted in two parts	Enquiry Number: 2711400001	Enquiry Date: 04.08.2014	Due date for submission of quotation: 05.09.2014

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.

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.

Sl.No	Description	Quantity
10	**Billet Saw**	02 No.
20	**Tube Layer Cutting Saw**	01 No.

as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)

Important points to be taken care during submission of offer

1. **Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**
2. **The EMD Amount for this Tender will be (INR) : 2,00,000.00**
3. **Delivery required 10 months from the date of purchase order.**
4. **In line with the mandatory requirement of Government of India, the Integrity Pact to be executed by BHEL and its suppliers as per the procedure. Hence we are enclosing the scanned copy of Integrity Pact. We request you to kindly download the attached Integrity Pact and affix your signature and seal in all the pages. In the page no. 8 of 8, in addition to your signature and seal please get the witness signature and seal. The witness signature from any one of your Organisation.**
   Duly filled Integrity Pact shall be submitted along with the tender document without fail.
5. **The tender will be monitored by IEM – Shri. D.R.S Chaudhary, IAS (Retd.)**
6. **All updates, amendments, corrigenda etc (if any) will be posted only on the above websites from time to time, as and when required, until tender is opened. There will be no publication of such updates, amendments corrigenda etc. through newspapers or any other media.**

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 above .

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. Engineer / MM / Capital Equipment

C. SARANYA
Senior Engineer
MM / Capital Equipment
BHEL / Tiruchirappalli - 620 014.

1 GENERAL:

1.1 This document deals with requirements for submitting offers and executing the order on placement of Purchase Order / Contract for the subject item. The equipment under this specification is required for Hot Rolling Mill in Seamless Steel Tube Plant at BHEL, Tiruchirappalli, for cutting Blooms into Billets of required length suitable for further process. The Bloom diameter is 200 mm and length varies from 5 metre to 12 metre.

1.2 Bidders have to submit the offers as below by filling in the "Vendor's response" column with relevant information against each point in the respective sections below by providing all the information. The technical requirements shall also be confirmed for each clause.

1.3 Note: A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the "Vendor's response" column is not acceptable and may lead to disqualification of the Technical offer.

1.4 Brand and Model No. of the items offered must be indicated in the offer.

1.5 The offer shall Consist of Sections:

1.5.1 Part A:

a. General Requirements
b. Technical offer
c. Commercial terms and conditions
d. Un-priced Price bid as per Part B (i.e. Price bid as per list shown in Part B of this specification with the price value blanked)

1.5.2 Part B: Price bid for all items with split-up for major components:

Sl. No.	Particulars	Qty	Rate
01			
02			
03			
04			
05			
06			

1.6 The supplier may visit SSTP and understand the requirements before bidding.

1.7 Break up cost for Main equipment and Optional systems / items shall be indicated separately.

1.8 Portion of Supplies from Foreign countries and from Indian sources shall be separately grouped both in the Technical offer (Part A) and in the Price bid (Part B).

1.9 An approximate break up of weight of each sub-system as above shall be indicated in the offer for comparison purpose.

1.10 List of spares with part identification no. (Tools, Mechanical, Electrical & Electronics) to be maintained for ensuring continuous operation with least delay time shall be provided in the offer with price.

2 QUALIFYING CRITERIA FOR THE SUPPLY

2.1 The VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for this equipment. Confirmation against each clause is to be indicated in the space provided.

Sl. No.	REQUIREMENTS	Vendor's confirmation and ref. to detail enclosed
1.0	The VENDOR shall have a minimum of FIVE Years of Continuous Experience in the Design, Manufacture and Supply of carbide tip bladed Billet Saws for minimum of 200 mm diameter billets for Hot Tube Mill/Rolling Mill with a sawing cycle time of maximum sixty seconds including material handling. Indicate the actual experience, Model no. and its sawing cycle time including material handling.	
2.0	The VENDOR shall have supplied at least 2 number of the offered model, within the last five years. The equipment shall be working satisfactorily at least for the past 2 years. Indicate the number of equipments (of QUOTED MODEL) sold in India & Other Countries. Reference List of Customers with full details of the customer's CONTACT PERSON for cross reference by BHEL shall be provided.	
3.0	Proof of performance of the offered equipment shall be provided in the offer based on similar systems supplied to other customers by way of CERTIFICATION OF PERFORMANCE FROM ATLEAST ONE CUSTOMER. The Certificate shall indicate the Order no., Date of installation, Model No. and the performance status for the last two years.	

2.2 The VENDOR has to necessarily provide the following details, for making an assessment of the firm's capability and competency: [The VENDOR 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]

Sl. No.	PARTICULARS	Vendor's response with ref. cl. No. of detailed offer.
1.0	Number of Years of Experience of the VENDOR in the field of design, manufacture and supply of 'Billet Saw for Tube mills'.	
2.0	YEAR of LAUNCH of the Model quoted against this ENQUIRY.	
3.0	Is there any other model launched after the quoted Model? If so, Why it is not quoted? Otherwise, indicate the likely year in which the next model is likely to be launched.	

4.0	Number of Saws for Seamless Steel Tube plant/Rolling Mill supplied, installed and commissioned till date, in the QUOTED MODEL both in India and abroad. Attach list of organisations with Model no. and contact details.	
5.0	Details of Design Set-Up and Technology Back-Up if any for the PRINCIPAL Equipment Maker.	
6.0	Details on International Standards followed in Design of the Equipment.	
7.0	Confirmation to performance testing requirement of the equipment prior to dispatch from supplier's end.	
8.0	Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed).	
9.0	Details on SERVICE-after-SALES Set-up in India including the addresses of Agents/Service Centers in India and Asia.	
10.0	Detail schedule and delivery period from the date of placing the Purchase Order.	
11.0	Any Additional Data to supplement the manufacturing capability of the VENDOR	

2.3 The VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the BHEL. Confirmation against each clause is to be indicated in the space provided.

Sl. No.	REQUIREMENTS	Vendor's confirmation and ref. to detail enclosed
1.0	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.	
2.0	The Commercial Offer (given with the Technical Offer – Part A) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of Scope of Supply.	
3.0	The points confirmed by the supplier based on the clarifications sought for the original offer shall be incorporated in the revised final offer wherever applicable. Pl. confirm	
4.0	The Vendor shall provide a complete list of out sourced electrical, electronic and mechanical components with Source name, Model no., Specification and drawings.	

3 JOB DESCRIPTION:

3.1 Seamless Steel Tubes are made by heating the billets in Furnace then Piercing, Pushing and SRM rolling process. The blooms supplied in long lengths need to be cut to required length by means of an automated heavy duty cutting machine of sufficient capacity to meet the requirement of this specification. The blooms are placed in a loading table and transferred to the cutting machine conveyor one by one. After cutting the blooms to the required lengths, the billets need to move to the outlet conveyor and the scrap piece is to be rejected into the scrap piece container. The parameter of the material to be processed in the machine are tabulated below:

Bloom diameter	200 mm
Incoming Length	5000 mm to 12000mm
Finished Length	650 mm to 1600mm
Length deviation	-0 mm to +2 mm max.
End surface deviation	1% (max. 2 mm from the perpendicular)
Last End piece length	500 mm to 1600 mm
Scrap Length	50 mm to 500 mm
Bloom supply	As Cast or Rolled
Material grade	Carbon steel & Alloy steel (Cr up to 13%)
Cycle time for one cut	60 sec. including positioning & cutting

4 QUANTITY

4.1 Two nos. of billet saws are required for cutting the blooms. The two saws are to be placed such that the cut billets move to the same outlet conveyor.

5 TECHNICAL DESCRIPTION OF SAW

5.1 GENERAL:

5.1.1 The sawing machine shall be designed with the latest, state of the art technology. The machine shall be of high power sawing capability, which is designed for cutting perfect square cut without burr. The cutting should be such that no metallurgical changes and cracks on the cut surface since billets are to be cut in cold condition. The machine shall be preferably of cold circular sawing type designed for the use of carbide tipped blades and Disc millers. The saw blades designed for using in the machine shall be of standard type and available in the regular market. The sawing machines shall be specifically designed for 3 shift operation.

5.1.2 The sawing machine shall be operating with low tooling cost, very less space requirements with minimum blade changing time.

5.1.3 Necessary damping unit and guiding system shall be incorporated for reducing vibration and chatter marks on cut edges. The guide ways and moving parts shall have necessary wear reduction methodologies like ball screw arrangement.

5.1.4 The Total system shall be in compliance to permitted emission levels (e.g. CE).The noise level of the system shall be below 85 dBA

5.2 MACHINE COLUMN

5.2.1 Extremely rigid construction according to the latest knowledge of vibration technology like special steel reinforced concrete to absorb any vibration and to make it extremely resistant to distortion shall be used.

5.2.2 For the erection and adjustment of the sawing machine, height adjustment leveling elements are to be provided.

5.3 SAW HEAD

5.3.1 The casing shall be of very rigid and stress free construction. The saw shall be designed with a sturdy main spindle bearing and gears should be extremely resistant to torsion. The gears used in the machine shall be with hardened and ground toothed wheels.

5.3.2 This system must have contactless retraction of saw blade.

5.3.3 The entire inside (bearings, toothed wheels) shall run in oil.

5.3.4 The machine shall be driven by three phase motor preferably with toothed belt or any sturdier drive system like direct drive etc. A continuous speed control system (like frequency transformer) shall be provided.

5.3.5 Rotating wire brush type cleaning system shall be provided for removal of chips from tooth gap.

5.4 FEED MECHANISM

5.4.1 Hardened guide rails need to be used for sliding area.

5.4.2 The drive shall be designed as a pre-loaded backlash-free type, preferably with ball screw arrangement. The feed drive of the saw head shall be driven by an AC servomotor or equivalent constant feed rate mechanisms.

5.4.3 Electronic systems to be incorporated for faster idle feed, cutting feed and rapid return feed automatically without manual interventions to reduce the total cutting cycle time.

5.4.4 Guide ways and other accessories shall be lubricated automatically by the central lubrication system.

5.5 BRUSH EQUIPMENT

5.5.1 A rotating chip brushing equipment with high service life to ensure cleaning of each cutting tooth and does not impair the quality of the cutters shall be provided.

5.6 SAW BLADE SPRAY LUBRICATION

5.6.1 For improved saw blade life, spray lubrication with nozzle-system shall be provided. The system shall include a container that is filled with a lubricant, pump, hose and sprayer. A fine layer of oil should be deposited on the blade tip. Necessary controls need to be provided for

adjusting the quantity of oil sprayed. The pneumatic system if any should function at an air pressure of 4 to 6 bar.

5.7 SAW BLADE COOLING EQUIPMENT

5.7.1 For the cooling of saw blade disc, necessary cooling systems to be provided. The pneumatic system if any should function at an air pressure of 4 to 6 bar.

5.8 CENTRAL LUBRICATION UNIT

5.8.1 A central lubrication unit shall be provided, intended for the lubrication of all the moving parts. The central lubrication unit shall be automated to operate at preprogrammed occasions.

5.9 CLAMPING EQUIPMENT

5.9.1 Rigid and wear resistant clamping arrangement at the entry and exit sides shall be provided.

5.9.2 For protection of the clamping equipments in the inlet and outlet, protection units are to be incorporated. These protection units shall be strong enough to absorb the hits of the bloom.

5.9.3 Type of clamping arrangement is to be mentioned in the offer.

5.10 MACHINE COVER

5.10.1 All movable parts of the sawing machine are to be covered and thereby the machine is protected against any accidents and unauthorised use.

5.11 SAW BLADE

5.11.1 The saw blade used shall be of Carbide tipped design. Sufficient no. of blades (Minimum 15 nos. per machine) shall be supplied for commissioning the equipment and initial trials. The details of blade including probable suppliers shall be provided, which includes:

1. Type of blade design - brazed tip or throw away insert type.
2. Suitability for cutting concast or rolled blooms for different grades of material up to 13% Cr steels.
3. Approximate blade life in terms of number of cuttings and number of regrinding that can be done.
4. Method of reconditioning and facility required for the regrinding
5. Optimum quantity of discs and inserts required per annum
6. Insert specification for both throw away / brazed type
7. Blade material specification, Chemistry, hardness value and grade of insert used.
8. Drawing for the saw blade with the above details and dimensions.
9. Sources for the procurement of disc & inserts

5.12 CUTTING DATA OF SAWING MACHINE

5.12.1 Cutting parameters, cutting cycle time and tool lifetime valid for offered saw blades shall be provided in the offer. These parameter's dependence on the material quality (inclusions) and alloying elements shall be provided as recommended by the saw blade supplier.

5.13 MATERIAL POSITIONING DEVICE (FEEDING TONG)

5.13.1 A system to be provided to cut the blooms to billets of required length. The necessary mechanical, hydraulic and electrical system need to be supplied for the operation. The positioning device (feeding tong) shall be easy to operate and set.

5.13.2 The length tolerance for cut billets needs to be within the permissible limits (0 to +2 mm).

5.14 **SCRAP REMOVAL SYSTEM**

5.14.1 End scraps of the billets to be removed from the cutting area by a scrap removal system. It should have arrangements to remove the scrap pieces automatically from the main cutting line. System should have the necessary hydraulics and electrical systems.

5.14.2 In case of longer end pieces, handling to be addressed so that it does not come to the main outlet conveyor.

5.14.3 Design for the scrap piece container need to be provided.

5.15 **CHIP REMOVAL SYSTEM**

5.15.1 A chain type chip conveyor to transports the chips into a container outside the sawing area need to be included. Type, size, design features shall be indicated in the offer.

5.15.2 Design for the container need to be provided.

5.16 **HYDRAULIC EQUIPMENT**

5.16.1 The hydraulic unit for the sawing plant shall be equipped with hydraulic pump, tank, accumulator, control valves, hydraulic cylinders and temperature and oil level indication device. Major components shall be from Rexroth only. The system shall be designed for continuous operation in 3 shifts. The system shall be controlled centrally.

5.17 **PNEUMATIC**

5.17.1 Compressed air at 4 bar min. pressure will be provided by BHEL. Necessary filtering unit, drying unit and control system shall be part of the supply.

5.17.2

ELECTRIC EQUIPMENT

GENERAL

Each sawing machine shall have a common set of switch cabinets, terminal boxes and an operator desk, motor protection system, necessary cooling system, modem and computerized operation etc. All components (except the PC) are connected via Profibus with a central CPU. The PC is connected with the CPU via TCP/IP.

SWITCH CABINETS

The switch cabinets are according to IP54. The main power supply for the sawing machine will be switched on/off by a main switch. Air conditioning is required in the cabinet doors to keep the temperature inside the cabinets. In the cabinets are the power supply units, the fuses and motor-protections, the frequency converters, the Servodrive-modules, the emergency units, the PLC etc.

The switch cabinet is to be designed for installation of all devices of the plant including inlet & out let conveyors. BHEL will supply and to install all field electrical equipment of the devices, which were manufactured by BHEL and automation of complete system is in the scope of supplier.

All drive modules are connected with Profibus.

All necessary cables among switch cabinets, operator desk, terminal boxes, hydraulic station, sawing machine and local sensors shall be in supplier scope.

The wiring work and all necessary cables among switch cabinets, operator desk, terminal boxes, hydraulic station, sawing machine and local sensors under supplier's scope of supply will be done by them. Cable length up to a maximum length of 30m shall be included between control cabinets and field boxes.

In order to achieve the reliability of signal transmission, the max length of the servo cables is 50 m is to be envisaged.

Main power supply (buyer's scope of supply)

Main Voltage : 3 x 415 VAC + PEN / 50Hz +/- 5Hz, TN-C-Network
(Terra-Neutral-Combined-Network)

Voltage fluctuation: +/- 10%

OPERATOR DESK IN OPERATING ROOM

The operator desk includes the following parts

- PC with keyboard, mouse and 17" TFT screen.
- Data input possibility at PC
- Cutting speed adjustment at PC
- Feed speed adjustment at PC
- Push buttons

With the PC the operator can work in manual and automatic mode.

Provisions for Push buttons/indications to be provided on the control desk in order to integrate the Roller conveyers and other accessories in discussion with BHEL after placement of order.

OPERATOR PANEL AT SAW

The operator panel at the sawing machine shall include the following parts

- Emergency Stop button
- Tool changing buttons
- Other buttons for local operation as required

TERMINAL BOXES

The terminal boxes are according IP66. There are all local digital and analogous inputs and outputs connected with the remote modules. Each terminal box is connected with the CPU via Profibus.

PLC

All components are connected with Profibus. CPU's cycle times shall be of less than 15ms. Only a basic knowledge of the program must be sufficient for modifications in existing program parts or for construction of new program parts

The hardware includes

- CPU
- Digital IN/OUT modules
- 15% spare I/O
- Interfacing modules connection including IN/OUT modules
- All the frequency converters/speed controllers and servo drive-modules should be of reputed make.
- For all the sub systems' in buyer's scope (like inlet conveyor, exit conveyors, transferring facilities etc) automation will be in the scope of supplier. Supplier has to communicate with sub-systems to the main PLC via hard wire signal. BHEL will provide the details of the above mentioned sub-systems. The cables will be laid and connected by the BHEL.

The following modes of control must be possible:

Manual

Every single step of the machine can be operated separately via commands from the PC. The operator has to select the commands with the mouse on the screen.

The working positions of the different devices (e.g. end layer…) are controlled by sensors, in order to prevent damages.

Single cut

Program for one complete sawing cycle without material handling.

Automatic

Program for fully automatic manufacturing cycle. Automatic will started by pressing the START button and will stopped anytime by pressing the STOP button.

PERSONAL COMPUTER

A visual and operative surface based on a PC. The PC is working with WINDOWS 7 (English) and is equipped with the authorized visualisation software. This must offer reliable operation, the data input, a clear presentation of processing data and also

- Input of material data
- Input of production data
- Input of tool data
- administration of commissions
- administration of tools
- fault message system
- operation instructions

The whole control desk visualisation is done in English language.

Self-diagnostic system

The visualised fault message page on the computer shows the actual fault message. Furthermore on the history page all former fault messages are stored and can be checked for maintenance purposes. The system automatically stops the operation as soon as it is displayed that one of the critical elements is malfunctioning.

SOFTWARE

Only licensed software's are used for the operation of the sawing machine.

DATA COMMUNICATION BY PROFBUS

Supplier can communicate with inlet and outlet roller table via hard wired cables.

MODEM

A modem shall be installed at the switch cabinets, which enables supplier to search and solve problems of the plant from their works. Thereby supplier delivers the modem and the BHEL is responsible for the internet connection.

FIELD PROGRAMMING UNIT (LAPTOP) FOR TROUBLESHOOTING

One FIELD PGU (Laptop) shall be supplied with all the required software and backupfor troubleshooting.

5.18 The technical data for the Saw shall be provided in a similar format as below

Machine data		
Total length	mm	
Total width	mm	
Total height	mm	
Flange diameter	mm	
Total weight	kg	
Operating parameters		
Cutting speed (min. and max.)	m/min	
Cutting Feed (min. and max.)	mm/min	
Rapid feed	mm/min	
Saw blades		
Saw blade diameter	mm	

Number of teeth/blade	nos.			
Blade changing time	Min.			
Sawing cycle time	sec.			
Rectangularity of cut				
Main drive motor with VFD				
Nominal power	kW			
Rated speed	Rpm			
Infinitely output speed range	Rpm			
Feed motor				
Nominal power	kW			
Infinitely feed speed		up to	mm/min	
Rapid return	mm/min			
Central lubrication device	kW			
Hydraulics	kW			
Control Systems				

5.19 **DOCUMENTATION**

5.19.1 The documentation shall be supplied one-fold on paper and one-fold on CD-Rom in English language consisting of the following:

- Machine erection and general notes
- Erection manual, assembly drawings and part list
- General description of function and function cycle
- Feed setting for different grades of material with respective cutting cycle time
- Saw blade specification and drawings
- Maintenance instructions
- Lubrication instructions
- Operating instructions
- Circuit diagram, cable list, etc.
- Hydraulic and switch plans
- Part list and wear part list
- Final foundation drawings, which contain all dimensions, cable channels and load indexes.

5.19.2 The documentation on CD-ROM shall be in the following format:

- Documents and lists in PDF format
- Drawings in DWG format
- Layout and foundation plan in DWG format

5.20 **TIME SCHEDULE UNTIL DATE OF SHIPPING**

5.20.1 The delivery time of supplying the equipment and the documentation at various stages of the contract as below shall be provided in the offer.

- Contract effectiveness
- Receipt of buyers workshop layout
- Preliminary Layout drawings of the sawing machine
- Confirmation of the preliminary layout by the BHEL
- Delivery of Basic Information
- Delivery of Basic Design
- Delivery of Detail Design
- Final foundation drawings, which contain all dimensions, cable channels and load indexes
- Hydraulic principle drawing

5.20.2 Electrical plan including drawing of control desk, cable list, final electricity content (power supply...), final dimension of operation desk, switch cabinet.

5.20.3 Delivery of the assembly drawings, spare and wear part list, information about the sawing machine

- Technical documentation
- Changed parts of the documentation

6 INSPECTION:

6.1 The system shall be shipped after inspection and testing at Suppliers works by BHEL. 30 days prior notice to be given for this inspection.

6.2 The system performance shall be checked for 200 mm diameter blooms, which will be provided by the supplier in hard grade material at least SA 213 T91.

7 DELIVERY:

7.1 The system need to be supplied to BHEL within 10 Months from the date of Purchase Order.

8 INSTALLATION OF THE SYSTEM:

8.1 The system shall be installed by the supplier or by their authorized representative under the supervision of supplier. Testing and commissioning is to be done by the supplier of the system.

8.2 Service shall be provided by the supplier during guarantee period and also later through AMC. The system supplied must be supported by way of spares, availability and service for a minimum period of 10 years.

8.3 Remote troubleshooting from Suppliers works is to be provided through ISDN-modem/ Ethernet connectivity.

9 PERFORMANCE EVALUATION & ACCEPTANCE OF THE SYSTEM:

9.1 Testing methods and acceptance norms for each subsystem for tests at Suppliers works and after installation shall be detailed out in the offer.

9.2 Production Run shall be tested for 24 hours continuously. The rated output for a reference size commensurate to the speed of cutting for that size shall be demonstrated for 8 hours shift.

10 GUARANTEE:

10.1 The equipment shall be guaranteed for a minimum period of 12 months from the commissioning date or 18 months from the date of dispatch whichever is earlier. The guarantees of the seller refer to: Acceptance Test, Sawing cycle time including billet positioning, Cutting quality, Cutting length tolerance, Noise level of <85 dBA, Rectangularity of cut surface and any other aspect agreed upon.

11 TRAINING:

11.1 Supplier shall provide operational and first level system maintenance training for two persons at supplier's works. Further training as required shall be provided at BHEL during erection commissioning for operation and maintenance.

1 GENERAL:

1.1 This document deals with requirements for submitting offers and executing the order on placement of Purchase Order / Contract for the subject item. The equipment under this specification is required for Hot Rolling Mill in Seamless Steel Tube Plant at BHEL, Tiruchirappalli, for cutting tubes to length suitable for shipment. The tube diameter varies between 31.8 and 133 mm, wall thickness between 3 and 14 mm and length between 4 and 24 meters.

1.2 Bidders have to submit the offers as below by filling in the "Vendor's response" column with relevant information against each point in the respective sections by providing all the information. The technical requirements shall also be confirmed for each clause.

1.3 Note: A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the "Vendor's response" column is not acceptable and may lead to disqualification of the Technical Offer.

1.4 Brand and Model No. of the items offered must be indicated in the offer.

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a. General Requirements
b. Technical offer
c. Commercial terms and conditions
d. Un-priced Price bid as per Part B (i.e. Price bid as per list shown in Part B of this Specification with the price value blanked).

1.5.2 Part B: Price bid for all items with split-up for major components:

Sl. No.	Particulars	Qty	Rate
01			
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1.6 The supplier may visit SSTP and understand the requirements before bidding.

1.7 Break up cost for Main equipment and Optional systems/ items shall be indicated separately.

1.8 Portion of Supplies from Foreign countries and from Indian sources shall be separately grouped both in the Technical offer (Part A) and in the Price bid (Part B).

1.9 An approximate break up of weight of each sub-system as above shall be indicated in the offer for comparison purpose.

1.10 List of spares with part identification no. (Tools, Mechanical, Electrical & Electronics) to be maintained for ensuring continuous operation with least delay time shall be provided in the offer with price.

2. QUALIFYING CRITERIA FOR THE SUPPLY

2.1. The VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for this equipment. Confirmation against each clause is to be indicated in the space provided.

Sl. No.	REQUIREMENTS	Vendor's confirmation and ref. to detail enclosed
1.0	The VENDOR shall have a minimum of FIVE Years of Continuous Experience in the Design, Manufacture & Supply of carbide tip bladed Tube layer cutting saw for tubes of wall thickness up to 14 mm for Hot Tube Mill/Steel Tube Mill with a sawing cycle time of maximum fifty seconds including clamping and declamping of the tubes. Indicate the actual experience, Model No. and its sawing cycle time.	
2.0	The VENDOR shall have supplied at least 2 number of the offered model, within the last five years. The equipment shall be working satisfactorily at least for the past 2 years. Indicate the number of equipments (of QUOTED MODEL) sold in India & Other Countries. Reference List of Customers with full details of the customer's CONTACT PERSON for cross reference by BHEL shall be provided.	
3.0	Proof of performance of the offered equipment shall be provided in the offer based on similar systems supplied to other customers by way of CERTIFICATION OF PERFORMANCE FROM ATLEAST ONE CUSTOMER. The Certificate shall indicate the Order no., Date of installation, Model No. and the performance status for the last two years.	

2.2. The VENDOR has to necessarily provide the following details, for making an assessment of the firm's capability and competency: [The VENDOR 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]

Sl. No.	PARTICULARS	Vendor's response with ref. cl. No. of detailed offer.
1.0	Number of Years of Experience of the VENDOR in the field of design, manufacture and supply of 'Tube Layer Cutting Saw for Tube mills'.	
2.0	YEAR of LAUNCH of the Model quoted against this ENQUIRY.	

3.0	Is there any other model launched after the quoted Model? If so, why it is not quoted? Otherwise, indicate the likely year in which the next model is likely to be launched.	
4.0	Number of Saws for Seamless Steel Tube plant supplied, installed and commissioned till date, in the QUOTED MODEL both in India and abroad. Attach list of organisations with model and contact details.	
5.0	Details of Design Set-Up and Technology Back-Up if any for the PRINCIPAL Equipment Maker.	
6.0	Details on International Standards followed in Design of the Equipment.	
7.0	Confirmation to performance testing requirement of the equipment prior to dispatch from supplier's end.	
8.0	Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed).	
9.0	Details on SERVICE-after-SALES Set-Up in India including the addresses of Agents/Service Centers in India and Asia.	
10.0	Detail schedule and delivery period from the date of placing the Purchase Order.	
11.0	Any Additional Data to supplement the manufacturing capability of the VENDOR.	

2.3. The VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the BHEL. Confirmation against each clause is to be indicated in the space provided.

Sl. No.	REQUIREMENTS	Vendor's confirmation and ref. to detail enclosed
1.0	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.	
2.0	The Commercial Offer (given with the Technical Offer – Part A) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of Scope of Supply.	
3.0	The points confirmed by the supplier based on the clarifications sought for the original offer shall be incorporated in the revised final offer wherever applicable. Pl. confirm.	

4.0	The Vendor shall provide a complete list of out sourced electrical, electronic and mechanical components with Source name, Model no., Specification and drawings	

3. JOB DESCRIPTION:

3.1. Seamless Steel Tubes made by hot rolling in long lengths in the Hot Mill need to be cut to length suitable for shipment by means of an automated heavy duty cutting machine of sufficient capacity to meet the requirement of this specification. The tubes are delivered to the cutting machine in a layer of a set of tubes varying in number from 1 tube to as many as needed to form a layer width of about 800 mm. The parameter of the material to be processed in the machine are tabulated below**:**

Tube diameter	min.	31.8 mm
	max.	133 mm
Outside diameter tolerance		- 0.1 to +0.4 mm.
Tube bending	max.	2 mm/m, 15 mm max.
Tube temperature	≤ °C	70
Wall thickness	min.	3 mm
	Max.	14 mm
Layer width	min.	31.8 mm
	Max.	800 mm
Incoming length	min.	5000 mm
	Max.	65000 mm
Finished length	min.	4000 mm
	max.	24000 mm
Finished length tolerance	min.	– 0 mm
	max.	+ 2 mm
Head scrap piece length	min.	100 mm
	max.	3000 mm

Tail scrap piece length	min.	100 mm
	max.	3000 mm
Material grade		Carbon steel & Alloyed steel (Cr up to 13%)
Cycle time for one cut		60 sec. including positioning & cutting

4 TECHNICAL DESCRIPTION OF SAW

4.1 GENERAL:

4.1.1 The sawing machine shall be designed with the latest, state of the art technology.The machine shall be of high power sawing capability, which is designed for cutting a layer of tubes. The machine shall be preferably of vertical type.

4.1.2 The sawing machine shall have horizontal and vertical clamping at the inlet and at the outlet for clamping the tube layers. To reduce the cutting time necessary measuring device to assess the layer width and diameter of the tubes to be cut for determining the beginning and end of cutting shall be provided.

4.1.3 The sawing machine shall be operating with low tooling cost, very less space requirements with minimum blade changing time. The saw blades designed for using in the machine shall be of standard type and available in the regular market.

4.1.4 Necessary damping unit and guiding system shall be incorporated for reducing vibration and chatter marks on cut edges. The guide ways and moving parts shall have necessary wear reduction methodologies like ball screw arrangement.

4.1.5 The Total system shall be in compliance to permitted emission levels (e.g. CE).The noise level of the system shall be below 85 dBA.

4.1.6 The sawing machines shall be specifically designed for 3 shift operation.

4.2 MACHINE COLUMN

4.2.1 Extremely rigid construction according to the latest knowledge of vibration technology like special steel reinforced concrete to absorb any vibration and to make it extremely resistant to distortion shall be used.

4.2.2 For the erection and adjustment of the sawing machine, height adjustment leveling elements are to be provided.

4.3 SAW HEAD

4.3.1 The casing shall be of very rigid and stress free construction. The saw shall be designed with a sturdy main spindle bearing and gears should be extremely resistant to torsion. The gears used in the machine shall be with hardened and ground toothed wheels.

4.3.2 This system must have contactless retraction of saw blade.

4.3.3 The entire inside (bearings, toothed wheels) shall run in oil.

4.3.4 The machine shall be driven by three phase motor preferably with toothed belt or any sturdier drive system like direct drive etc. A continuous speed control system (like frequency transformer) shall be provided.

4.3.5 Rotating wire brush type cleaning system shall be provided for removal of chips from tooth gap.

4.4 FEED MECHANISM

4.4.1 Hardened guide rails need to be used for sliding area.

4.4.2 The drive shall be designed as a pre-loaded backlash-free type, preferably with ball screw arrangement. The feed drive of the saw head shall be driven by an AC servo motor or equivalent constant feed rate mechanisms.

4.4.3 Electronic systems to be incorporated for faster idle feed, cutting feed and rapid return feed automatically without manual interventions to reduce the total cutting cycle time.

4.4.4 Guide ways and other accessories shall be lubricated automatically by the central lubrication system.

4.5 BRUSH EQUIPMENT

4.5.1 A rotating chip brushing equipment with high service life to ensure cleaning of each cutting tooth and does not impair the quality of the cutters shall be provided.

4.6 SAW BLADE SPRAY LUBRICATION

4.6.1 For improved saw blade life, spray lubrication with nozzle-system shall be provided. The system shall include a container that is filled with a lubricant, pump, hose and sprayer. A fine layer of oil should be deposited on the blade tip. Necessary controls need to be provided for adjusting the quantity of oil sprayed. The pneumatic system if any should function at an air pressure of 4 to 6 bar.

4.7 SAW BLADE COOLING EQUIPMENT

4.7.1 For the cooling of saw blade disc, necessary cooling systems to be provided. The pneumatic system if any should function at an air pressure of 4 to 6 bar.

4.8 CENTRAL LUBRICATION UNIT

4.8.1 A central lubrication unit shall be provided, intended for the lubrication of all the moving parts. The central lubrication unit shall be automated to operate at preprogrammed occasions.

4.9 CLAMPING EQUIPMENT

4.9.1 The sawing machine shall have horizontal and vertical clampings at the inlet and at the outlet for clamping the tube layers. For protection of the clamping equipments in the inlet and outlet, protection units are to be incorporated. These protection units shall be strong enough to absorb the hits of the tubes.

4.9.2 The clamping equipment shall be designed to be rigid enough and has an integrated linear measuring device, which enables a measurement of the width of the layer and the necessary stroke to cut-off the tube layer.

4.9.3 A measuring system, which measures the layer height which is equal to the tube diameter with the integrated linear measuring, shall also be provided. These measuring values are for start of cut and stroke required.

4.9.4 Type of clamping arrangement is to be mentioned in the offer.

4.10 **MACHINE COVER**

4.10.1 All movable parts of the sawing machine are to be covered and thereby the machine is protected against any accidents and unauthorised use.

4.11 **SAW BLADE**

4.11.1 The saw blade used shall be of Carbide tipped design. Sufficient no. of blades (Minimum 15 nos.) shall be supplied for commissioning the equipment and initial trials. The details of blade including probable suppliers shall be provided, which includes:

1. Type of blade design - brazed tip or throw away insert type.
2. Suitability for cutting concast or rolled blooms for different grades of material up to 13% Cr steels.
3. Approximate blade life in terms of number of cuttings and number of regrinding that can be done.
4. Method of reconditioning and facility required for the regrinding.
5. Optimum quantity of discs and inserts required per annum.
6. Insert specification for both throw away / brazed type.
7. Blade material specification, Chemistry, hardness value and grade of insert used.
8. Drawing for the saw blade with the above details and dimensions.
9. Sources for the procurement of disc & inserts.

4.12 **CUTTING DATA OF SAWING MACHINE**

4.12.1 Cutting parameters, cutting cycle time and tool life time valid for offered saw blades shall be provided in the offer. These parameter's dependence on the material quality (inclusions) and alloying elements shall be provided as recommended by the saw blade supplier.

4.13 **END CUTTING STOPPERS**

4.13.1 Two separate systems are to be provided to cut head end of tube layer as well as tail end of tube layer to the required length.

4.13.2 The positioning system is to be of easily adjustable type to cut finish tube length of the range 100 mm to 3000 mm.

4.13.3 It can be of hydraulic cushioning type stopper which will smoothly set the batch of tubes to the required length.

4.13.4 Position system shall enable cutting of tubes as indicated in clause 3.1. The length tolerance for the tubes needs to be within the permissible limits (0 to +2 mm).

4.14 **LENGTH POSITIONING DEVICE**

4.14.1 A system is to be provided to cut a layer of tubes to the required length.

4.14.2 The positioning system is to be of easily adjustable type to cut finish tube length of the range 5 m to 24 m.

4.14.3 It can be of hydraulic cushioning type stopper which will smoothly set the batch of tubes to the required length.

4.14.4 Position system shall enable cutting of tubes as indicated in clause 3.1. The length tolerance for the tubes needs to be within the permissible limits (0 to +2 mm).

4.15 **SCRAP REMOVAL SYSTEM**

4.15.1 Head and tail end of the tubes to be removed from the cutting area by a scrap removal system. It should have arrangements to remove the scrap tube pieces automatically from the main cutting line. System should have the necessary hydraulics and electrical systems.

4.15.2 Design for the scrap tube container need to be provided.

4.16 **CHIP REMOVAL SYSTEM**

4.16.1 A chain type chip conveyor to transports the chips into a container outside the sawing area need to be included. Type, size, design features shall be indicated in the offer.

4.16.2 Design for the chip container need to be provided.

4.17 **HYDRAULIC EQUIPMENT**

4.17.1 The hydraulic unit for the sawing plant shall be equipped with hydraulic pump, tank, accumulator, control valves, hydraulic cylinders and temperature and oil level indication device. The system shall be designed for continuous operation in 3 shifts. The system shall be controlled centrally.

4.18 **PNEUMATIC**

4.18.1 Compressed air at 4 bar min. pressure will be provided by BHEL. Necessary filtering unit, drying unit and control system shall be part of the supply.

4.19 **ELECTRIC EQUIPMENT**

4.19.1 **GENERAL**

Each sawing machine shall have a common set of switch cabinets, terminal boxes and an operator desk, motor protection system, necessary cooling system, modem and computerized operation etc. All components (except the PC) are connected via Profibus with a central CPU. The PC is connected with the CPU via TCP/IP.

4.19.2 SWITCH CABINETS

The switch cabinets are according to IP54. The main power supply for the sawing machine will be switched on/off by a main switch. Air conditioning is required in the cabinet doors to keep the temperature inside the cabinets. In the cabinets are the power supply units, the fuses and motor-protections, the frequency converters, the Servodrive-modules, the emergency units, the PLC etc.

The switch cabinet is to be designed for installation of all devices of the plant including inlet & out let conveyors. BHEL will supply and to install all field electrical equipment of the devices, which were manufactured by BHEL and automation of complete system is in the scope of supplier.

All drive modules are connected with Profibus.

All necessary cables among switch cabinets, operator desk, terminal boxes, hydraulic station, sawing machine and local sensors shall be in supplier scope.

The wiring work and all necessary cables among switch cabinets, operator desk, terminal boxes, hydraulic station, sawing machine and local sensors under supplier's scope of supply will be done by them. Cable length up to a maximum length of 30m shall be included between control cabinets and field boxes.

In order to achieve the reliability of signal transmission, the max length of the servo cables is 50 m is to be envisaged.

Main power supply (buyer's scope of supply)

Main Voltage : 3 x 415 VAC + PEN / 50Hz +/- 5Hz, TN-C-Network
(Terra-Neutral-Combined-Network)
Voltage fluctuation: +/- 10%

4.19.3 **OPERATOR DESK IN OPERATING ROOM**

The operator desk includes the following parts

- PC with keyboard, mouse and 17" TFT screen.
- Data input possibility at PC
- Cutting speed adjustment at PC
- Feed speed adjustment at PC
- Push buttons

With the PC the operator can work in manual and automatic mode.

Provisions for Push buttons/indications to be provided on the control desk in order to integrate the Roller conveyers and other accessories in discussion with BHEL after placement of order.

4.19.4 **OPERATOR PANEL AT SAW**

The operator panel at the sawing machine shall include the following parts

- Emergency Stop button
- Tool changing buttons
- Other buttons for local operation as required

4.19.5 **TERMINAL BOXES**

The terminal boxes are according IP66. There are all local digital and analogous inputs and outputs connected with the remote modules. Each terminal box is connected with the CPU via Profibus.

4.19.6 **PLC**

All components are connected with Profibus. CPU's cycle times shall be of less than 15ms. Only a basic knowledge of the program must be sufficient for modifications in existing program parts or for construction of new program parts

The hardware includes

- CPU
- Digital IN/OUT modules
- 15% spare I/O
- Interfacing modules connection including IN/OUT modules
- All the frequency converters/speed controllers and servo drive-modulesshould be of reputed make.
- For all the sub systems' in buyer's scope (like inlet conveyor, exit conveyors, transferring facilities etc) automation will be in the scope of supplier. Supplier has to communicate with sub-systems to the main PLC via hard wire signal. BHEL will provide the details of the above mentioned sub-systems. The cables will be laid and connected by the BHEL.

The following modes of control must be possible:

Manual

Every single step of the machine can be operated separately via commands from the PC. The operator has to select the commands with the mouse on the screen.

The working positions of the different devices (e.g. end layer…) are controlled by sensors, in order to prevent damages.

Single cut

Program for one complete sawing cycle without material handling.

Automatic

Program for fully automatic manufacturing cycle. Automatic will started by pressing the START button and will stopped anytime by pressing the STOP button.

4.19.7 **PERSONAL COMPUTER**

A visual and operative surface based on a PC. The PC is working with WINDOWS 7 (English) and is equipped with the authorized visualisation software. This must offer reliable operation, the data input, a clear presentation of processing data and also

- Input of material data
- Input of production data
- Input of tool data
- administration of commissions
- administration of tools

- fault message system
- operation instructions

The whole control desk visualisation is done in English language.

4.19.8 **Self-diagnostic system**

The visualised fault message page on the computer shows the actual fault message. Furthermore on the history page all former fault messages are stored and can be checked for maintenance purposes. The system automatically stops the operation as soon as it is displayed that one of the critical elements is malfunctioning.

4.19.9 **SOFTWARE**

Only licensed software's are used for the operation of the sawing machine.

4.19.10 **DATA COMMUNICATION BY PROFBUS**

Supplier can communicate with inlet and outlet roller table via hard wired cables.

4.19.11 **MODEM**

A modem shall be installed at the switch cabinets, which enables supplier to search and solve problems of the plant from their works. Thereby supplier delivers the modem and the BHEL is responsible for the internet connection.

FIELD PROGRAMMING UNIT (LAPTOP) FOR TROUBLESHOOTING

One FIELD PGU (Laptop) shall be supplied with all the required software and backupfor troubleshooting.

4.20 The technical data for the Saw shall be provided in a similar format as below

Machine data		
Total length	mm	
Total width	mm	
Total height	mm	
Flange diameter	mm	
Total weight	kg	
Saw blades		
Maximum saw blade diameter	mm	
Thickness	mm	

Blade revolution	rpm	
No. of tooth	Nos.	
Layer width		
Biggest layer width	mm	
Main drive data three phase motor		
Nominal power	kW	
Rated speed	rpm	
Infinitely output speed range	rpm	
Feed motor AC Servo motor		
Nominal power	kW	
Infinitely feed speed	up to in mm/min	
Rapid return	mm/min	
Central lubrication device	kW	
Hydraulic	kW	
Control Systems		

4.21 **DOCUMENTATION**

4.21.1 The documentation shall be supplied one-fold on paper and one-fold on CD-Rom in English language consisting of the following:

- Machine erection and general notes
- Erection manual, assembly drawings and part list
- General description of function and function cycle
- Feed setting for different grades, outer diameter and wall thickness with cutting cycle time
- Saw blade specification and drawings
- Maintenance instructions
- Lubrication instructions
- Operating instructions
- Circuit diagram, cable list, etc.
- Hydraulic and switch plans
- Part list and wear part list

- Final foundation drawings, which contain all dimensions, cable channels and load indexes.

4.21.2 The documentation on CD-ROM shall be in the following format:

- Documents and lists in PDF format
- Drawings in DWG format
- Layout and foundation plan in DWG format

4.22 **TIME SCHEDULE UNTIL DATE OF SHIPPING**

4.22.1 The delivery time of supplying the equipment and the documentation at various stages of the contract as below shall be provided in the offer.

- Contract effectiveness
- Receipt of buyers workshop layout
- Preliminary Layout drawings of the sawing machine
- Confirmation of the preliminary layout by the BHEL
- Delivery of Basic Information
- Delivery of Basic Design
- Delivery of Detail Design
- Final foundation drawings, which contain all dimensions, cable channels and load indexes
- Hydraulic principle drawing

4.22.2 Electrical plan including drawing of control desk, cable list, final electricity content (power supply...), final dimension of operation desk, switch cabinet.

4.22.3 Delivery of the assembly drawings, spare and wear part list, information about the sawing machine.

- Technical documentation
- Changed parts of the documentation

5 INSPECTION:

5.1 The system shall be shipped after inspection and testing at Suppliers works by BHEL. 30 days prior notice shall be given for this inspection.

5.2 The system performance shall be checked on a set of tubes, which will be provided by the supplier minimum and maximum size range for hard grade material at least SA 213 T91.

6 DELIVERY:

6.1 The system need to be supplied to BHEL within 10 Months from the date of Purchase Order.

7 INSTALLATION OF THE SYSTEM:

7.1 The system shall be installed and commissioned by the supplier of the system.

7.2 Service shall be provided by the supplier during guarantee period and also later through AMC. The system supplied must be supported by way of spares, availability and service for a minimum period of 10 years.

7.3 Remote troubleshooting from Suppliers works is to be provided through ISDN-modem/ Ethernet connectivity.

8 PERFORMANCE EVALUATION & ACCEPTANCE OF THE SYSTEM:

8.1 Testing methods and acceptance norms for each subsystem for tests at Suppliers works and after installation shall be detailed out in the offer.

8.2 Production Run shall be tested for 24 hours continuously. The rated output for a reference size commensurate to the speed of cutting for that size shall be demonstrated for 8 hours shift.

9 GUARANTEE:

9.1 The equipment shall be guaranteed for a minimum period of 12 months from the commissioning date or 18 months from the date of dispatch whichever is earlier. The guarantees of the seller refer to: Acceptance Test, Sawing cycle time with material transport, Cutting quality, Noise level of <85dBA, Rectangularity of cut surface and any other aspect agreed upon.

10 TRAINING:

10.1 Supplier shall provide operational and first level system maintenance training for 2 persons at supplier's works. Further training as required shall be provided at BHEL during erection and commissioning for operation and maintenance.