

ANNEXURE - II

TECHNICAL SPECIFICATIONS FOR REVAMPING OF ELECTRICAL CONTROL SYSTEM IN NEW MODERN CUT OFF

Sl. No	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (with complete Technical Details)
1	APPLICATION of existing machine	Vendor to note
1.1	The machine is designed for cutting and end chamfering of straight tubes made of different grades of steel. These tubes form components of Boiler segment of Thermal Power Plant. IMPORTANT NOTE: a) The machine is intended for Tube Build-up into segments of 2 to 14 meters in length, 31.8 to 76.1mm diameter , maximum tube thickness 12mm as per requirement , with floor space of 18m X 4.5m. b) The steel grades of tubes can be carbon steel , alloy steel, stainless steel, Inconel etc. c) The tubes after cutting into required dimensions are then subjected to welding in different machine (not our concern) as part of production process.	
2	AIM OF SPECIFICATION	Vendor to note
2.1	Revamping of Electrical control system by complete replacement of existing electrical system by New Electrical Control Panel System (Majorly comprising of Drives, PLC, Modules, motors except hydraulic etc.) and Interfacing the same with machine.	[BIDDER is expected to give technical write up on Proposed Electrical control system, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements]
3	Brief Operation procedure	
3.1	Modern Cutting-Off Machines are dual-spindle, lathe-type machines designed for production cutting-to-length of round tubing, pipes. Job is fed through the spindle to a stop which measures the cut length, then held by a collet and rotated while being cut off with tools mounted on cross slides, followed by chamfering the O.D. of both ends while cutting off. Any type of material that can be turned with standard tooling can be cut off. Common PLC is used for controlling two head with independent control.	
3.2	The cutting tool is operated by Pneumatic cylinders actuated by limit switches and solenoid valves. The machine is equipped with live feed rolls that feed job through the spindle to an adjustable stop. When lengths of job tube is loaded between the feed rolls, the machine cycles automatically.	
3.3	The basic steps are:-Rack operation,Infeed operation,collet movemnt,Cutting,Chamfering,Kick out,Outfeed , Rack out & Infeed operation	
3.4	Vendor may visit factory before quoting in case any further clarification/doubts needs to be cleared. Vendor to study the Machine operation sequence before dismantling.	
3.5	Vendor to ensure following during commissioning activities:-	
3.5.1	Understanding of complete operating procedures and sequences involved in existing machine before interfacing with new panel.	
3.5.2	Understanding of Electrical protection system.	
3.5.3	As per above, necessary steps to be taken while programming PLC.	
3.5.4	As per above, necessary steps to be taken while setting drive parameters.	
3.5.5	Dismantling and disconnecting existing electrical control panels and all associated components.	
3.5.6	Erecting new panel.	
3.5.7	Necessary channel foundation or modification in existing panel support structure in case required for erecting above.	
3.5.8	Mounting all components with complete wiring.	
3.5.9	Power supply connection and control supply connection.	
3.5.10	Interfacing of field equipments viz. motors , sensors, encoders etc. with panel.	
3.5.11	Ensure isolation between I/O Modules and PLC through relays.	
3.5.12	Ensure proper DC supply to field equipments and control equipments.	
3.5.13	Earthing (Electronic as well as Electrical components including panel)	
3.5.14	Proveout during actual load conditions on few sample basis.	

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4	Existing machine Components	Vendor to note
4.1	Existing control panel is made of Allen-Bradley make PLC CPU, POWER UNIT & I/O MODULES.	
4.2	Major component details given only for study purpose.	
4.3	All minor components are not listed here. Vendor has to study the existing machine.	
4.4.0	Major component details	
4.4.1	VF DRIVE(Bar feeder) - 1 Nos	
	Make : Allen-Bradley	
	Model : 160-BA01NPS1P1	
	Power Rating : 0.37 kw / 0.5 HP	
4.4.2	VF DRIVE(Bar feeder) - 1 Nos.	
	MAKE: YASKAWA V-1000	
	MODEL: CI MR-VT4A0005BAA	
	KW: 2.2/1.5	
4.4.3	VF DRIVE (SPINDLE DRIVE) - 2 Nos	
	Make : Allen-Bradley	
	CAT No : 1336F-B030-AN-EN-HAS2-L6	
	Power Rating : 30-38 KVA / 30 HP	
4.4.4	160 DRIVE DC INTERFACE - 1 No	
	Make : Allen-Bradley	
	Model : 160 - DM - PS1	
4.4.5	Allen - Bradley FLEX I/O MODULE - 2 Nos.	
	24 VDC POWER SUPPLY R10 ADAPTER	
	Make : Allen-Bradley	
	Model : 1794 - ASB	
4.4.6.	Allen - Bradley FLEX I/O MODULE - 8 Nos.	
	24 VDC Sink Input	
	Make : Allen-Bradley	
	Model : 1794 - IB16 with 1794 - TB3	
4.4.7	Allen - Bradley FLEX I/O MODULE - 5 Nos.	
	120VAC TRIAC OUTPUTS	
	Make : Allen-Bradley	
	Model : 1794 - OA16 with 1794 - TB3	
4.4.8	Allen - Bradley FLEX I/O MODULE - 1 Nos	
	10PT SINK INPUT / 6PT SOURCE OUTPUT	
	Make : Allen-Bradley	
	Model : 1794 - IB10XOB6 with 1794 - TB3	
4.4.9	Allen - Bradley FLEX I/O MODULE (F2 SIDE) - 1 No	
	8 PT RELAY OUTPUT MODULE	
	Make : Allen-Bradley	
	Model : 1794 - OW8 with 1794 - TBN	
4.4.10	OPERATOR PANEL DISPLAY - 1 No	
	Make : Allen-Bradley	
	Model : PANEL VIEW - 300	
	CAT No : # 2711 - K3A17L1	
	Input : 24 VDC, 0.42 A	
4.4.11	7 SLOT SLC CHASSIS -1 No	
	Make : Allen-Bradley	
	Model : 1746 - A7	

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4.4.12	PLC CPU, POWER UNIT & I/O MODULES	
	Make : Allen-Bradley SLC 5/04 CPU	
	Model (POWER) : 1747 - P1	
	Model (CPU) : 1747 - L542	
	Model (EEPROM) : 1747 - M11	
	Model (SCANNER) : 1747 - SN	
	Model (ENCODER) : 1746 - HSCE	
	Model (32 PT INPUT) : 1746 - IB32 - 2 Nos	
	Model (16 PT TRIAC OUTPUT) : 1746 - OA16	
	Model (SLOT FILLER) : 1746 - N2	
4.4.13	INTERFACE BLOCK FOR 1746 - IB32	
	Make : Allen-Bradley	
	Model : 1492 - 1FM40F	
4.4.14	BAR FEEDER ENCODER	
	Make : DYNAPAR	
	Model : # HA62525000001	
4.4.15	MOTORS DETAILS	
i	SPINDLE MOTOR - 2 No	
	Make : US EECRIC	
	KW : 22.38	
	Speed : 1470	
ii	BAR FEEDER MOTOR	
	MAKE: SUMITOMO GEAR MOTOR	
	KW : 0.18	
	Speed : 1300	
	Rated Current : 0.57	
iii	HYDRAULIC MOTOR - 2 Nos	
	US ELECTRICAL MOTORS	
	HP : 3	
	VOLT: 208/415 V , 50 HZ	
	AMPS: 9/4.5	
	Speed : 1465	
iv	FEED MOTOR (Base mount)	
	Make : KIRLOSKAR	
	KW : 0.37	
	Speed : 1300	
	Rated Current : 0.57	
v	RUN OUT TABLE FEED MOTOR (Base mount)	
	Make : KIRLOSKAR	
	KW : 0.37	
	Speed : 1300	
	Rated Current : 0.57	
vi	BAR FEEDER LEVELING MOTOR	
	Make : SUMITOMO GEAR MOTOR	
	KW : 0.18	
	Speed : 1300 , WITH GEAR RPM: 72	
	Rated Current : 0.57	
vii	RUN OUT TABLE LEVELING MOTOR	
	Make : SUMITOMO GEAR MOTOR	
	KW : 0.18	
	Speed : 1300	
	Rated Current : 0.57	

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5	SPECIFICATION AND SCOPE OF SUPPLY	Vendor to confirm and justify.
5.1	All motors and drives except hydraulic motor are to be replaced. All motors should be of minimum EFF1/IE2 & IP55 protection. Vendor may visit BHEL site to know the suitable frame size of motor.	
5.2	PLC PANEL - CPU controller with DI/DO of High speed encoder module associated relay modules, I/Os, programming software Licensed version and cable.	
5.3	Panel shall be of free standing or machine mounted with suitable size and IP54 protection with suitable A/C.	
5.4	Minimum 10 Inch colour touch panel to be flush mounted on the control desk with Ethernet interface / communication cable and programming data cable along with software to be supplied.	
5.5	All encoders required for the machine are vendor scope.	
5.6	All limit switched and sensors are under vendor scope.	
5.7	Portable data loader with operating system, 4hrs battery backup and power supply adapter, high frequency meter, clamp meters and tool kit - 1 set	
5.8	Control panel of suitable size shall be provided. It may be noted that machine is running with two heads. controls for each head should be given in separate compartment. Independent operation of heads are required.	
5.9	Two heads should be controlled by common PLC, each head should work independently and fault on one head should not affect the other one.	
5.10	Number of electrical panels (drive panel and PLC) may be separated or compile together as per suitability.	
5.11	Control desk for flush mounting the touch panel, functional, pushbuttons, selector switches, and indication lamps for auto/manual operation.	
5.12	The supplier should supply suitable energy meter with suitable ratings of Current transformers and required accessories to connect in the incoming supply of the equipment.	
5.13	3Ph power and shielded control cables for connecting the field elements, motors to PLC panel and to the control desk.	
5.14	Erection of the above items, laying of all cables, testing, programming and commissioning are the scope of vendor.	
6	MAKE DETAILS:	
6.1	PLC and TOUCH PANEL MAKE: SIEMENS/ABB/MITSUBISHI/Schneider Electric/Yaskawa/ Allen Bradley	
6.2	Control Elements :TELEMECHANIQUE/L&T/ SIEMENS/Schneider Electric/MITSUBISHI	
6.3	Encoder make - Autonics / heidenhain / stegmann or any reputed make acceptable to BHEL.	
6.4	VFD makes - SIEMENS/ABB/MITSUBISHI/Schneider Electric/Yaskawa/ Allen Bradley	
6.5	Motors make - Siemens, Mitsubishi, Bharat bijlee or any reputed make acceptable to BHEL.	
6.6	Sensors Make - Omron, IFM or any reputed make acceptable to BHEL.	
6.7	All Pneumatic system components make including Tubings, fittings, valves, manifold, etc are SMC/ FESTO/PARKER/ROSS only	
7	All control elements shall be of 24V and Pneumatic coils are to be 24V with LED indication.	
8	ELECTRICAL & ELECTRONICS SYSTEMS	
8.1	415V + 10% / -10%, 50HZ +/-3 Hz, 3 Phase AC (3 wire system without neutral) power supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor.	Vendor to confirm
8.2	Tropicalization: All electrical / electronic equipment shall be tropicalized.	Vendor to confirm
8.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to confirm
8.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm
8.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters /receptacles should have compatibility with Indian equivalents.	Vendor to confirm
8.6	Motors & other electrical components shall conform to IEC or Indian Standards	Vendor to confirm
8.7	All necessary cables along with cable trays (if required) for laying of cables should be included in the offer.	Vendor to confirm
8.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm
8.9	All Electric enclosures shall have IP 54 protection	Vendor to confirm
8.10	Suitable transformers are to be used for 24V/ 230V / 110V supply. Only 3ph 415V supply will be provide in panel.	

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9	PNEUMATIC SYSTEM:	
9.1	Pneumatic system to be replaced with latest stack/manifold type model with new fittings & tubings for efficient pneumatic operation of the machine.	Vendor to confirm
9.2	The pneumatic operated elements of the machine shall work efficiently with BHEL compressed air supply at a pressure of 4.5 to 5.0 kg/cm ² in ¾ inch line.	Vendor to confirm
9.3	Air Booster of suitable capacity to be provided for efficient operation of the machine, Bidder shall furnish the information for Air Booster of suitable capacity.Qty:1 No	Vendor to confirm
9.4	FRL to be provided to eliminate moisture content from the compressed air at the designed flow and pressure rating.Qty:1 No	Vendor to confirm
9.5	BHEL will provide compressed air at only one point near / on the machine (4.5 to 5.0 kg/cm ² in ¾ inch line). Bidder shall provide suitable filter-regulator-lubrication (FRL) unit and in addition a hand wheel valve at this point with Quick Release Coupling.	Vendor to confirm
9.6	Hydraulic, Pneumatic & Lubricating oil piping should be preferably metallic except places where flexible piping is essential. All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to confirm
10	IN-BUILT SAFETY ARRANGEMENTS	
10.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm
10.2	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to confirm
10.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to confirm
10.4	a. Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece and the operator due to the malfunctioning or mistakes. b. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on PLC display and panels) should be available.	Vendor to confirm
10.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to confirm
10.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm
10.7	All lubricated parts like Bed, guide ways shall have provision for collecting the used Lubrication oil from machine guide ways and preventing them from spilling over on to the ground.	Vendor to confirm
11	ERECTION & COMMISSIONING:	
11.1	Commissioning of the Equipment and Smooth Functioning of all the Sub-Systems (at BHEL Works) shall be the RESPONSIBILITY of the Supplier.	
11.2	All the materials required for the commissioning shall be the supplier's scope.	
11.3	Performance Prove-Out After the successful commissioning of the machine and sub-systems, the COMMISSIONING ENGINEER and the APPLICATION ENGINEER of the Supplier have to establish the Performance Prove Out for the Machines Capability and the Production Rate of the Machine (existing rate of production)	
12	TOOLS FOR ERECTION, OPERATION & MAINTENANCE	
12.1	The Vendor shall bring special tools and equipment required for erection of the machine. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer.	Vendor to confirm
13	MACHINE SPARES	
13.1	Itemized break-up of spares used in the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis shall be offered by vendor. The list is to include following, in addition to other recommended spares: (Unit Price for each item of spare shall be offered)	Vendor to confirm
13.2	Electrical / Electronic / PLC Spares: All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Spares for PLC System, Power Module & Control Cards for Drives etc.	Vendor to confirm
13.3	All types of spares for total machine and accessories shall be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	Vendor to confirm
13.4	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm
13.5	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm

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13.6	Mechanical & Pneumatic Spares: All types of Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, PU hoses, bearings, sprockets, chains etc..(Shall include in scope of supply).1 No in each type shall be supplied.	Vendor to confirm

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Sl. No	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (with complete Technical Details)
14	DOCUMENTATION	
14.1	Three sets of following documents (3 Hard copies,) in English language should be supplied along with the machine	Vendor to confirm
14.2	Operating Manuals of Machine & PLC system	Vendor to confirm
14.3	Programming Manuals of PLC system	Vendor to confirm
14.4	Maintenance, Interface & commissioning manuals for PLC system, spindle & feed drives.	Vendor to confirm
14.5	Detailed Maintenance Manual of Machine with all drawings of machine assemblies / sub-assemblies / parts including Electrical / Pneumatic diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also	Vendor to confirm
14.6	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm
14.7	Detailed specification of all rubber items, pneumatic & lube fittings	Vendor to confirm
14.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Voltage Stabilizer, Isolation Transformer and all supplied Accessories	Vendor to confirm
14.9	PLC program printouts with comments in English.	Vendor to confirm
14.10	PLC program on CD & PLC data on CD and in data logger are to be provided. Data logger should have complete PLC software, VFD software and HMI software.	Vendor to confirm
14.11	Complete back up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back up and reloading of a new hard disk.	Vendor to confirm
14.12	The vendor shall submit complete Master List of spare parts used in the machine.	Vendor to confirm
14.13	One additional set of all the above documentation shall be given in the form of CD/DVD (English Language).	Vendor to confirm
15	TRAINING	
15.1	The Vendor shall train two BHEL's Engineers in PLC/Touch Panel at Respective OEM Works for 2 working days on each.	Vendor to confirm
15.2	The Vendor shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance after the commissioning of the Machine at BHEL works for not less than 2 working days.	Vendor to confirm
15.3	Boarding & lodging for the BHEL Trainees shall be borne by BHEL.	Vendor to confirm
15.4	Vendor to quote for training on per man per week basis for training at vendor's work	Vendor to confirm
15.5	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to confirm
16	Drawing approval	
16.1	All drawing including Electrical, Pneumatic, control panel layout and bill of materials are to be submitted for approval with in 20 days from date of PO / LOI whichever is earlier.	Vendor to confirm.
16.2	Only after approval of drawing, manufacturing should be started.	Vendor to confirm.
17	PANEL ERECTION & COMMISSIONING	
17.1	Vendor to take full responsibility for erection, vendor shall start up, test the machine, it's control & all types of other supplied equipment, carrying out machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Vendor in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by Vendor in advance	
17.2	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment (if any) required to carry out all above activities should be brought by the Vendor.	Vendor to confirm.
17.3	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	Vendor to confirm.
17.4	Schedule of Erection and Commissioning shall be submitted along with drawing.	Vendor to confirm.
17.5	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor.	Vendor to confirm.
18	AMBIENT CONDITIONS & THERMAL STABILITY	
18.1	Total machine including PLC System and all items shall work trouble free and efficiently under following operating conditions & shall give specified accuracies. Power Supply: Voltage : 415 V $\pm$ 10%, 3 Phase AC Frequency : 50 Hz $\pm$ 3% The machine shall be suitable for an ambient temperature of +50 ° C and relative humidity of 85 % respectively, but both do not occur simultaneously [The offered machine components shall be suitable for the above and details of provisions on the machine for the same are to be furnished by Vendor]	Vendor to confirm.
18.2	The machine, including attachments and accessories, should be suitable for 24 hrs. Continuous operation to its full capacity for 24 hour a day and 7 days a week throughout.	Vendor to confirm.

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19	PROVE-OUT OF BHEL COMPONENTS	
19.1	a. The prove-out trials of the system shall be for the straight tubes for sizes given by BHEL during the technical discussions / at the time of releasing the Purchase Order. b. The production rate expected out of the machine, as detailed under the Specification Clause No. 3, will be the base.	Vendor to confirm.
20	GUARANTEE TERMS	
20.1	Performance Guarantee for a minimum period of 12 months (for the machine in total and sub-systems or bought-out items in particular) from the date of acceptance of the machine.	Vendor to confirm.
20.2	Vendor Shall Visit the Machine in the presence of area maintenance executive to study the layout and understand the requirement before quoting the offer. Otherwies offer shall be liable for rejection.	Vendor to confirm.