Ref: NFG/RMD/KMD/2020/09/51237

Date 09-03-2020

Sub: Notice inviting tender for Design, Fabrication, demonstration at supplier’s works, supply, Installation and commissioning of “10 T 2 pillars hydraulic compacting press at purchaser’s site” as per Annexure 1

1. Scope
   Design, fabrication, demonstration at supplier’s works, supply, Installation and commissioning of “10 T 2 pillars hydraulic compacting press with Glove box” as per Annexure 1, Fig. 1

   Quantity = 01 (one)

   General guidelines for submitting tender

   • You shall send your offer in a sealed envelope indicating delivery period, price inclusive of taxes and other relevant information by speed post to:

   Head,
   Radiometallurgy Division
   NFG
   Radiological labs.
Bhabha Atomic Research Centre  
Trombay,  
Mumbai 400085  
(Kind Attention : K M Danny, SO/F)

- Quotation shall reach us on or before 30.03.2020 by Speed Post Only

- On top left corner of the envelope please indicate Quotation For:

"Design, fabrication, demonstration at supplier's works, supply, Installation and commissioning of "10 T 2 pillars hydraulic compacting press with Glove box at purchaser's site " as per Annexure 1 and due date 30.03.2020

- Overwriting, scratching etc. must be avoided in the quotation. Rewriting the whole figure shall carry out any alteration in the figure. The authorised person from the firm shall countersign such figure.

- The delivery period mentioned in the quotation shall be strictly adhered to. If the contractor fails to supply and secure extension of delivery date before effecting delivery of the supply against the contract, acceptance of such item by the purchaser will in no way prejudice the right of the purchaser to levy liquidated damage nor will it be entitled to the contractor for payment of statutory levies that comes into force after the expiry of the delivery date.

- Minimum Guarantee / Warranty period of the material shall be one year.

- Supplier shall mentioned clearly the GST/PAN /TAN no. on quotation.

- GST number shall be clearly mentioned on Quotation

- Please note that BARC being an R&D organisation, the applicable rate of GST is 5% as per notification no. 47/2017 dated 14-11-2017. A certificate for concessional rates of GST shall be issued to the supplier.

- All the charges and taxes shall be mentioned clearly
- Early delivery schedule will be given a consideration.
- You may contact us for any clarification on or before 27.03.2020 (Shri K M Danny, 25590661 or Shri R.K.Mittal, 25590770 Ext. 20770)

2. PLACE OF DELIVERY:

The inspected and accepted components shall be delivered to:

Stores Officer
Radiological Zonal Stores.
Bhabha Atomic Research Centre
Mumbai 400 085.

3. PAYMENT TERMS:

Full payment will be made only after the satisfactory completion of Work order and delivery of "10T 2 pillars hydraulic compacting press". Please note that income tax @ 2% will be deducted from your bill. No part payment or advance payment will be made. For this mode of payment, you are required to draw your invoice in the name of Associate Director, Nuclear Fuels Group, Bhabha Atomic Research Centre, Mumbai 400085, in triplicate along with Advance Stamp receipt and to be submitted along with "10T 2 pillars hydraulic compacting press".

4. CONFIDENTIALITY CLAUSE:

No party shall disclose any information to any third party, concerning the matters under this contract generally. In particular, any information identified as "Proprietary" in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party.
This clause shall apply to the sub-contractors, consultants, advisers or the employees engaged by a party with equal force.


Any contravention of the above-mentioned provisions by any contractor, sub-contractor, consultant, adviser or the employees of a contractor will invite penal consequences under the aforesaid legislation.

Prohibition against use of BARC's name without permission for publicity purposes:- The contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use BARC's name for any publicity purpose through any public medium like press, radio, T.V. or Internet without the prior written approval of BARC.

(K M Danny)

SO/F, RMD
ANNEXURE I

10 T 2 Pillar Automatic Hydraulic Powder Compacting Press

Specification:

Name of the item: 10 T 2 Pillar Automatic Hydraulic Powder Compacti

ng Press

Qty: 1 unit.

Design, fabrication, demonstration at supplier's works, supply, installation and commissioning at purchaser's site of “10 T 2 pillars hydraulic compacting press with Glove box” as per the following technical specifications and schematic drawing.

Scope of supply:

The supply consists of 10 T 2 Pillar Automatic Hydraulic Powder Compacti

ng Press with complete hydraulic and electrical systems. Glove box (01 No.) shall be issued to the successful bidder as Free Issue Material (FIM).

The scope includes:

a. Preparation of manufacturing drawing,

b. Submission to purchaser for approval,

c. Fabrication as per approved drawings and technical specifications,

d. Inspection and testing at fabricator's premises,

e. Transportation, installation and commissioning at BARC, Trombay

Technical Specification:

The hydraulic press shall consist of three major parts as given below.

1.1 Press Body shall be suitably sized to accommodate in 1095 x 1095 x 1095 mm enclosure.

1.2 Electrical control panel size shall be limited to 300 (D) x 1000(L) x 760(H) mm

1.3 Hydraulic System size shall be limited to 1050(L) x 750(W) x 650(H) mm for locating below the enclosure.

These three parts shall be as per the specification given below.

1.1 Press Body

The press body shall be built as per details given below.

Type of Frame: Four Hollow Column & 2 pillars passing through the same and amply Guided. Press shall be made of Two fixed plates fixed on top of the pedestal plate and tied through 2 hollow column. On top plate Top cylinder shall be fixed & on the sides of top cylinder plate bottom cylinder shall be fixed with suitable reinforcements to take the compaction & ejection loads. A moving platen with 2 guide rods connected to top cylinder shaft rigidly. This top platen shall be guided on moving top fixed platen and moving in between top fixed platen and middle fixed platen where die shall be fixed, 2 no. Bottom cylinders shall be fixed in between the hollow columns on the die fixing platen. One more moving frame made out of two platen, connected by 4 no. of tie bars cum guide rods precisely guided in hollow column. At bottom platen of this frame bottom punch shall be fixed. Feeder assembly shall be fixed at the back side of the middle fixed platen.
Type of platen:
1. Top moving Bottom Punch Platen
2. Top Fixed platen (Top Cylinder Fixing Platen)
3. Top Punch Moving platen.
4. Middle Fixed Platen for Fixing the Die
5. Bottom Punch Moving platen

UPPER RAM
Downward compacting capacity: 10 Tons max. (Adjustable from 0.5 to 10 tons)
Withdrawal Capacity: 05 Ton
Cylinder bore diameter: 90 mm
Rod Diameter: 63 mm
Stroke: 150 mm
Distance Between Bottom & Top Platen: 290 mm
Open Daylight: 190 mm
Working Area: 310 mm x 220 mm
Fast approach Speed: 120 mm/sec
Pressing Speed (Double Pump system): 20 mm/sec
Return Speed: 120 mm/sec

LOWER RAM 2 no. Cylinders
Upward compacting capacity: 10 Tons max. (Adjustable from 0.5 to 10 tons)
Cylinder Bore size: 63 mm
Rod diameter: 45 mm
Stroke (Ejection Stroke): 75 mm
Stroke Adjustment for ejection & filling: by means of scale
Control Accuracy when using limit switches: ±0.10 mm
Open Day light (Gap between bottom of die: 126 mm
Platen & top of bottom moving platen)
Effective Working area: 380 mm x 220 mm
Compacting speed: 20.5 mm/sec
SVE: RK. MUR: 004: 018/019 4 25th April, 2018
Ejection speed: 41 mm/sec
Downward speed (Fill/Return of cylinder): 40 mm/sec
Ejection pressure control: 100 kg to 10000 kg in steps of 2 kg (Adjustable)
Display of Ejection & compaction force: On Man Machine Interface

Potentiometric Scale along with the controller
   a. Stroke of scales: 150 mm for top ram: 100 mm for bottom ram
   b. Accuracy: 25 Micron
   c. Display: On Man machine Interface

DIE & PUNCHES
Size: As per Purchasers dimensions
Qty : One set Single cavity Die Set & One set Multiple cavity Die Set along with the
machine along with all
die, top punch & bottom punch holding arrangement.
Length of Die : 85 mm
Length of Top Punch : 100 mm
Length of Bottom Punch : 120 mm

Accuracies (as per JIS Grade I)
Flatness for 300 mm : LR 0.027 mm FB 0.027 mm
Parallelism : LR 0.054 mm FB 0.054 mm
Perpendicularity : 0.035 mm

Deflection & Rigidity: Deflection of the structure under full load on 2/3rd area shall
be 0.17 mm / meter span.

Hydraulic System
Tank Capacity : 100 to 200 liters
Electric Motor : 12.5 HP
Type of Pumps : 1 no. radial piston type 7.62 lpm capacity double pump
1 no. 23.04 lpm vane pump (70 bar)
Working pressure : 315 bar
Design Pressure : 350 bar
Type of controls : Logic type completely manifolded
Pressure Control : Independent for upper and lower ram by means of separate pressure
control valve and the control shall be displayed on PLC by using Pressure Transducers.
Type of Pressure Gauge: Industrial Grade hydraulic pressure gauge filled with
Glycerine Lubrication System: Motorized auto lubrication with level and pressure
switch to ensure oil in the tank and lubrication at all the points respectively. The
frequency and duration of each lubrication period will be controlled by using 2 timers.

Electrical System
Supply : 415 V ±5 %, 50 Hz, 3 phase AC
Features
- DOL soft starter for main motor with all safety backups and main isolator
interlocked with control panel
- Fans for individual Electronic control panel.
- Electrical control panel will be consist of required push button operated and
rotary switches, relays, contractors and pre-programmed electrical circuit. All
components will be of reputed make with cluster free wiring with high quality
insulated wires. If required due to space restrictions, panel may be split up into
two sections so that main operating switches etc are housed in a compact panel
not to exceed 300 (D) x 1000 (L) x 750 (H) mm for locating conveniently near the
operating area. Connection: from the electrical control panel to the press body
and hydraulic system will be through high quality heavy duty insulated wiring of about 6 meters length.

- Press operations will be done from local control panel which consists of relay, timers, contactors, variable speed drives, thyristor drives, isolators, indicating lamps, switches, fuses, MCB, push button switch for Start / Stop emergency key operated switch (with mechanical latch on pushing) as per requirement, terminal stripe, cable channels, isolation control power supply transformer, surge protection circuit, earth bus bar, mains power supply isolation switch, PLC, DC power supplies, Transducers/Current transformers, indicating meters, annunciation (tirno, alarm etc.),
- A separate pendant consisting of ON/OFF switch, speed adjustment knob, key operated switch etc. installed on a floor mounted free standing pedestal. The pendant will be provided with a suitable length of cable for a lead of up to 6 meters.
- Control voltage: 24 VDC
- Control logic: Through PLC & MMI
- Electronic System: PLC with programmer card and man machine Interface, Digital display / read out of all timers, Total Production counter, Target Production Counter

Software System
Programmable Cycle selectors, Platen Positions & timer settings.
- Manual / Semi Auto
- Type of Fill - Under fill / Normal Fill
- Ejection - Held / Unheld
- Temporary Stop Time
- De-aeration Timer
- Dwell Timer
- Decompression Timer
- Top platen Top position
- Top platen Fast to Slow position
- Double Compaition Start position
- Top platen down end position
- Bottom Punch ejection Position
- Fill position
- Under position
- Cycle Delay timer
- Cycle Counter (only display, no alteration possible & can be reset with a password & key)

Modes of Operation (Directly Selectable from Man Machine Interface With conjunction with Manual / Auto Selector Switch)

Manual Mode
Where all cylinders can be inched up / down or forward / reverse to set the tool with corresponding interlocks.
Semi Auto Mode:
In this cycle, the powder filling shall be done manually and all other sequence of operations are same as Single auto Cycle.

Single Compaction Mode:
In this mode during compaction the bottom ram made static and only the top ram shall be descending for compaction of the powder filled in the cavity. The Bottom ram shall be used only as an ejector in this cycle.

Double Compaction Mode:
In this mode during compaction both the top and bottom rams are moved forward simultaneously for compaction of the powder filled in the cavity. The density of compact will be better and more uniform due to the compaction from both the sides.

Ejection Mode UNHELd:
In this mode after the top ram retracts to its original position (i.e. upward position and gives the signal for the bottom ram to move upwards. The bottom ram moves upwards at ejection speed and ejects the compact from the cavity (i.e. in this mode the compact shall be ejected after the ram returns and hence it shall be 'Ejection Not Held Mode').

Ejection Mode HELD:
In this mode after the compaction is completed the top ram shall not retract to its original position. Instead the high pressure shall be released and the top ram will dwell at this position. After the dwell period is over, the bottom ram shall move upward and eject the compact under held condition and stops (i.e. the top ram holds the compacts and shall be moved upward along with the compact by the bottom ram). After the ejection is over the top ram shall return to its original position.

TYPE OF POWDER FEEDING:
Manually
Under Fill Mode:
Bottom punch shall go down by a small distance to avoid spillage of powder during the die entry of the top punch and to maintain constant weight of the compacts.

Pressure release:
This facility shall be provided to release the stored energy by decompression.

MATERIAL OF CONSTRUCTION
The material of construction for the parts mentioned shall be as given below:
1) Material for parts of Press
   All Platens including Pedestal plate : SS 304
   Load direct Bear Platens : SS - 410 Toughened
   Guide Pillars : SS - 410 Hardened & Ground
   40 - 42 HRc hardness,
   Guide Bushes : Ph. Bronze IS Grade II Casting
   Cylinder Seals : Parker / Equivalent
   O'Rings : Viton Rubber
   Hydraulic Pipes : Seamless Cold Drawn
Piston Rod: SS -410 Hardened 40 -42 HRc & ground,
Hydraulic Fittings: As per DIN Standard
Fasteners: 'High Tensile' of TVS
Powder Sliding Plate: SS - 410 hardened
Die: D2 (Prime material vacuum hardened)
Punches: D2 (Prime material Vacuum hardened)
All die holders or clamps: SS - 410 hardened
Electric motor: Siemens IE2
Hydraulic Pump: Polyhydron or Yuken or both
Hydraulic valves: Polyhydron/Yuken/Bosch - Rexroth automation

Position Sensors: Gefran
Pressure Transducer: Gefran
Pressure Gauge: Mass
Switch gear: Siemens
Pushbuttons: Siemens / Tecnic
PLC & Man Machine Interface: Siemens
Cylinder Seals: Metric Parker Make or equivalent
'O' rings: Viton rubber
Hydraulic Piping tubes: Seamless cold drawn
Hydraulic Pipe Fittings: As per DIN Standard of Hi-Tech Engineers
Fasteners: 'High tensile' of TVS

CONSTRUCTION OF THE MACHINE
The 2-pillar type press shall consist of top fixed platen, top moving platen, middle fixed platen, bottom moving platen and hardened SS - 410 tie bars used as guidance for moving platens. Top fixed platen shall be rigidly fixed to middle fixed platen (i.e. die bolster) through fix spacer that will also act as guide housing for bottom platen guide rods.

Bottom moving platen shall be driven by the 2 no. of bottom cylinders which are fixed on the top fixed platens. These cylinders rods are rigidly fixed to top most moving platens above top fixed platens. The top most fixed platen shall be rigidly fixed to bottom moving platen through 2 no. of hardened, ground guide pillar cum tie bars of SS - 410.

Top punch cylinder shall be mounted on top fixed plate in such a way that all the stresses are borne without causing fatigue. Bottom punch cylinder shall also be mounted on the side of top fixed platen connected to top platen of the bottom punch press assembly.

All the moving platens shall be accurately machined, ground, jig bored within ± 10 microns. The entire press shall be placed on machine stand and which is designed to take the press load as well the load of the enclosure supplied by the user. Power pack shall be housed below the press stand and electrical panel shall be placed on the side of the press stand suitably on the floor mounting stand as per the purchaser's requirement.
SEQUENCE OF OPERATION:

Manual mode:
All the operations like
- TOP PUNCH
- BOTTOM PUNCH
- Any other device / peripheral item purchaser would like to add to operate. Forward, reverse, up, down etc. shall be done independently by actuating respective push buttons or from the touch keys on the MMI in inching mode.

SEMI AUTO MODE:
Initial conditions for running Semi auto mode :
- Selector on Semi auto mode
- Pump ON
- Top punch at top position
- Bottom punch at up set position
- Selection of Under Fill On
- Ejection Mode UNHELD
Now when the operator actuates the auto start push button the following cycle shall occur.
1. Bottom punch moves to its set bottom position (Die Fill Position)
3. By pressing Auto start Push button once again Bottom cylinder shall move down to under fill position to create additional cavity so as to prevent powder from spilling out during top punch entry in to the die during pressing cycle.
4. By pressing Auto start Push button once again top ram shall move down at fast speed and slows down on actuating speed changeover position and enters the die & stops till the temporary stop timer times out.
5. During temporary stop time the bottom punch shall start moving upward and thus tries to push the powder out of die through clearance between top punch & die.
6. After the temporary timer times out one timer for de-aeration shall start, which helps the entrapped air to get released between powder and top punch to avoid blistering effect or cracks in the compact?
7. After the timing out of de-aeration timer the double compaction shall start & now Top and bottom punches starts compacting the filled powder simultaneously.
8. The punches stops on achieving the set pressure and dwells at this pressure till the set time called pressure dwell.
9. After set time is over decompression cycle shall take place
10. Then the top punch retracts to its top set position and stops.
11. The ejection of component by the bottom punch cylinder to its ejection position.
12. This completes one cycle and to restart the operator has to actuate the push button again.

HYDRAULIC SYSTEM (Hydraulic system shall consist of the following items):
1. Fabricated Tank
2. Pump
3. Electric Motor
4. Relief Valve
5. Solenoid Valves
6. Suction oil strainer
7. Return line filter
8. Pressure gauges with isolation valves
9. Oil level indicator
10. Air breather
11. Manifold

The leakage of oil either from hydraulic tank, fittings or cylinder will be precluded. Noise free and oil leakage free operation shall be ensured by the supplier and this will form part of pre-despatch inspection for approval of the press by the purchaser.

Remarks:

1. The surface finish of all the machined components and coating of the press shall be such that, powder deposited on the surface can be easily cleaned in fewer swipes.
2. There shall be no sharp corners.
3. Grooves or any such features on the press shall be avoided to the extent possible, so as to avoid accumulation of powder.

[Signature]

Darren K. M.

FD&MS, RMD
Fig.1. Schematic of Hydraulic Press (10 T, 2 pillars)

All dimensions are in mm