सी एस आई आर - प्रगत पदार्थ तथा प्रक्रम अनुसंधान संस्थान
CSIR - ADVANCED MATERIALS & PROCESSES RESEARCH INSTITUTE
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्)
COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
होशंगाबाद रोड, हबीबगंज नाका के पास, भोपाल – 462 026
HOSHANGABAD ROAD, NEAR HABIBGANJ NAKA, BHOPAL – 462 026
(दूरभाष क्र./Phone No.: 2488809, 2457609, 2457615 फैक्स क्र./Fax No.:0091-0755- 2488355/2488985)
ई-मेल /E-mail spo@ampri.res.in वेबसाइट/ **Website : www.ampri.res.in,**

Title: Expression of Interest and pre-indent conference for supply Installation and Commissioning of **"E-beam powder bed fusion additive manufacturing facility".**

This Institute invites e-bids for Expression of Interest (EOI) through CPP Portal for supply Installation and Commissioning of **"E-beam powder bed fusion additive manufacturing facility"**

The EOI should be submitted through CPP Portal latest by **28.11.2022 up to 11.00am** and shall be opened on **29.11.2022** at **11.00am**. A Pre-indent Conference (through Offline) has been scheduled to be held at **02:00 pm** on **29.11.2022** in the **meeting room of admin building, at CSIR-AMPRI, Bhopal**

Interested parties may depute their competent technical representatives to make presentation of their product/ model(s) and discuss with the Technical Committee on the aspects of utility, technology, feature, literature, design, technical parameters, clientele and other related issues of the equipment. The Technical Committee shall also evaluate the credentials/ technical capabilities/ financial standings with track record of the companies/ vendors attending PIC.

Process of EOI and PIC :

Last date of submission of EOI 28.11.2022 up to 11.00am.

Opening of Bid: 29.11.2022 at 11.00am

PIC : on 29.11.2022 at 02.00 pm (Through Offline)

1) OEM/Suppliers/Indian Agent should :
   Submit e-bid for Expression of Interest through CPP Portal to participate in pre-indent Conference latest by **28.11.2022 up to 11.00am**. along with Printed technical Literature duly indicating point to point AMPRI requirement and offered point to point technical compliance.
2) Attend Pre-Indent Conference by fully Technical Competent personnel on : **29.11.2022 at 02.00 pm** to present before AMPRI Technical Committee:
   i) Specific Model and make: meeting AMPRI technical specifications.
   ii) Power point presentation of AMPRI Technical specification requirement and its compliance.
   iii) One printed copy of Supporting Technical Literature.

Tentative Technical Specification are as per **Annexure – I**

Technically competent representative should be authorized for attending Pre-Indent Conference who can take on the spot decision and confirm on the points raised by Technical Committee. Technical representative should be able to sign the final technical specifications finalized by the CSIR-AMPRI Technical Committee.

On the basis of EOI cum PIC, the technical committee may shortlist the parties for further course of procurement process keeping in mind the suitability and feasibility in terms of CSIR-AMPRI's requirement. All prospective bidders are invited to attend positively. Non-attendance / poor presentation may lead to rejection of the party in shortlisting process. However CSIR-AMPRI keeps the liberty of deciding mode of procurement.

Interested parties may submit EOI in the form of e-bid through CPP Portal. Only online offers will be entertained from the registered bidders of CPP Portal. Last date of submission of EOI is 28.11.2022 up to 11.00am and shall be opened on 29.11.2022 at 11.00am.

भंडार एवं क्रय अधिकारी /Stores & Purchase Officer

(Annexure- I)

Tentative Specifications

Technical Specifications for "Electron Beam (E-beam) Powder Bed Fusion Additive Manufacturing Facility"

1.0 Build Chamber

1.1	Maximum Build Size (W x D x H) :	200 x 200 x 380 mm or more
1.2	Maximum Beam Power :	3000W or more
1.3	Cathode Type :	Tungsten filament or better
1.4	Minimum Beam Diameter:	250µm or lower
1.5	Maximum EB Translation Speed:	8000 m/s or more
1.6	Vacuum Technology:	Pumping should be done by rotary pump followed by turbo pump
1.7	Vacuum Pressure:	i. Column Pressure: 1x10-7 mbar or better ii. Chamber Pressure: 10-5 mbar or better iii. Build Atmosphere: 5 x 10-3 mbar or better
1.8	He Consumption during Build process:	1 liter/h or less
1.9	He Consumption during Build cool down:	75 liters/build cycle or lower
1.10	Maximum processing temperature:	Bed Temperature 1100°C or above
1.11	**Open software for process development for new materials is must**	

1.11 The system should be capable of processing all the standard materials listed. Process parameters, Process data and process theme for these standard materials should be provided Standard Build materials:

i. Titanium Ti6Al4V
ii. Nickel Alloy 718

1.12 Supplier has to submit reference literatures that assure that machine is suitable and has been used for processing other third party materials below

i. TiNi / TiAl
ii. Cobalt-Chrome, ASTM F75
iii. Pure Cu
iv. Pure W
v. Stainless steel
vi. Aluminium Alloys

1.13 CSIR-AMPRI is planning to use the EBM system for Graphene reinforced metal/ alloys composites. The EBM system should be able to process non-standard alloy powders without affecting the warranty. Required training to create process data or process theme for all the non-standard alloys should be provided. Any criteria to check suitability of the powder for EBM system should be included in the Bid. Any restriction on types of powder should be described with the bid.

1.14 Build Properties for standard Ti-6Al-4V and IN718

a. Porosity: 0.2% or lower
b. Surface Roughness: Sa value 35µm or lower
c. Typical Geometrical Accuracy: +/- 0.2mm or better
d. Min. Resolution in Hole diameter: min 0.5mm or better
e. Min. Resolution in Feature thickness: min 0.3mm or better

1.15 Quality of Build : Quality of the build should be same at entire build area

2.0 Powder Recovery System

Suitable Powder recovery systems should be included for standard materials quoted above. Un-melted powder should be removed from the built components by blasting in a closed chamber. Recovered powder should be usable after sieving. The powder recovery system should have all the operational provisions mentioned above for efficient recovery of powders.

3.0 Consumable and Site Pack:

Necessary consumables, tools and site spares for the EBM Machine.

4.0 Water Cooling:

Chiller unit for adequate cooling in EBM system according to the ambient condition

5.0 Tele-servicing:

Provision for Tele-servicing of the machine using high speed Ethernet connection will be desirable

6.0 Software:

Term Software includes slicing software, build processor and machine control & operation. Software should be able to convert files to STL, repairs errors, edits designs and prepares them for the build platform. Modules for support generation and to create lightweight structure, lattice structure or functional surfaces should be also included. This should have the following, among others:

a) Option for uploading/import of standard CAD files (.stp file format).
b) There should not be any restriction on file size.
c) Software should be able to generate sliced layers
d) Option for user defined build strategy as well as tool path sequencing strategy
e) Build processor to generate process theme. It should have option to change build parameters and create user defined build strategy and process theme.
f) Generation of program and AM operation
g) Software should be provided in CD/DVD/Pen drive also (As a backup in case of any failure)
h) software licence with out any limitation and all updates for next 3 years minimum.

7.0 Materials:

Ti-6Al-4V grade 23 EBM powder- 100kg
Inconel 718 powder, Aluminium Alloy, Pure Cu & W, 20 Kg/minimum to operate machine.

All powders should have spherical morphology and Particle Size Distribution (PSD) should be 45-106μm. Supplied material should be suitable for the EBM system as per the quality standard of the EBM system and powders should be suitable to provide build quality specified in the specifications.

Material data sheet and test report should be enclosed. Ti-6Al-4V and In718 alloy should have certification as Aerospace grade.

8.0 Safety:

Entire machine should be as per International / European safety standards (EN ISO 12100:2010 and EN60204-1) during entire operation with respect to radiation safety, powder safety and electrical safety. It should have necessary protective enclosures, all safety accessories and safety interlocks. The Supplier should comply with all Safety features and incorporate all safety for controls and operator while in operation from possible damages and injury. Automatic machine shutoff/warnings in the event of malfunctioning beyond pre-set limits.

X-ray radiation leakage should be well within limits mentioned in international safety standard table 1.0 of AWS C7.1-2004

9.0 Qualification:

9.1 Bidder has to submit EBM manufactured Ti-6Al-4V & Inconel 718 alloy component in as-build condition. The sample must be manufactured in their own machine similar to what they are offering. The submitted sample will be used for technical qualification. Sample will be analysed for geometrical accuracies, surface roughness and Oxygen content in the build. The build quality should be equal or better than criteria mentioned and described below

a. Porosity: 0.2% or lower
b. Surface Roughness (in as deposited condition): 35µm or lower
c. Geometrical Accuracy: +/- 0.2mm or better
d. Oxygen content in the built component must be lower than 0.15%

9.2 OEM should have supplied at least 05 (five) systems of similar specifications in the last 03 years in India or worldwide and those systems should be in operation till date

9.3 The Supplier should provide support documents to show their Customers' list (at least five of them) with contact details. Performance certificate of latest of them should also be submitted with technical bid.

10 Installation and Commissioning:

Installation and commissioning of the machine to be done by the supplier at CSIR AMPRI and proving out of the machine and demonstration of all the features is to be carried out by the supplier at CSIR AMPRI

The layout, pre-installation requirements and foundation drawing of the offered machine and all the peripheral equipment should be enclosed with the Technical offer

11 Utilities/Infrastructure for installation:

a) Supplier shall indicate all the required utilities/infrastructure such as power, water, gas, etc. including power backup requirements.
b) Supplier shall provide overall dimensions of the Unit along with floor area/height of the site or building, including foundation details if any, for accommodating the system and sub-systems.
c) The layout, pre-installation requirements and foundation drawing of the offered machine and all the peripheral equipment should be enclosed with the Technical offer
d) The operating environment for the system and sub-systems including temperature and humidity control, anti-vibration, EMI, EMC etc. should be indicated.

12 Training:

Suitable training to enable safe, efficient operation and maintenance of the machine. The training must include:

a) Machine operation, system handling
b) Application development with design and build rules
c) Build optimizations and process knowledge.
d) Detailed software training for basic and advance operations
e) Preventive maintenance, detailed maintenance training for unscheduled and specialized maintenance requirements, troubleshooting etc
f) Process development using non-standard powders
g) Handling of post-processing equipment for powder recovery and other accessories

13 Warranty:

The system must be under warranty for a period of 2 years (un-conditional warranty) and another 2 years AMC from the date of its satisfactory installation, commissioning, and demonstration against all manufacturing defects. If the system is found to be defective during this period, the whole equipment or part thereof will have to be repaired/replaced by the supplier free of cost to CSIR AMPRI. During the guarantee / warranty period, the downtime of the equipment will be recorded with the details of date and type of complaint/fault. The vendor should attend it and make the equipment operational within reasonable and stipulated time. The downtime more than the stipulated time after reporting the complaint/fault will be added to calculate cumulative downtime. The guarantee/warranty period will be extended automatically by this cumulative downtime. However, if the items are under guarantee/warranty for a period of more than one year, it may be specifically mentioned in the quotation. In case the supplier fails to rectify the defects and equipment is not put to proper function to our satisfaction, the supplier will replace the whole equipment to our satisfaction or whole money paid by CSIR AMPRI on the account of purchase of the equipment will be refunded by supplier to CSIR AMPRI. All the software updates during the warranty period shall be supplied, installed and trained to our personnel on real time basis at free of cost.

14 Documentation:

The following documents (Hard copy 2 sets and soft copy in CD/Flash drive/HDD) in English Language to be provided to CSIR AMPRI:

a) User manual, operation manual and maintenance manual (for mechanical, electrical and electronic hardware circuits) of the entire system and sub-systems.
b) System administration and maintenance manual- shall cover detailed system configuration and administration with the help of sketches. The safety instructions, maintenance schedule, preventive maintenance schedule with possible errors and troubleshooting to be provided.
c) Standard operating procedure (SOP), calibration, software manual
d) Original software licences for all the software included in the supply
e) Calibration certificates as per international standard of all the artifacts. Reference standard used for the same shall be provided to CSIR AMPRI.
f) All the data and results of testing and calibration of the entire system at manufacturer's site as well as at CSIR AMPRI shall be properly documented and supplied to CSIR AMPRI.
g) Certificate for general compliance with standard, safety and protection

15 Vendor Qualification:

15.1 Original Equipment Manufacturer (OEM) or authorized representatives of OEM only can quote for this tender. Vendor should submit authorization letter valid on tender date from OEM along with the quotation

15.2 The OEM should have proven expertise of at least 5 years in manufacture and supply of the item

15.3 Offered system should be a proven model in the market and should not be a prototype or developmental system

15.4 It is essential that the bidder/OEM should provide support documents to show their at least 05 (five) customers' list with contact details.

15.5 Bidder must submit EBM manufactured Ti-6Al-4V & Inconel 718 alloy component in as-build condition as per the attached drawings. CAD models will be provided by AMPRI. The sample must be manufactured in their own machine similar to what they are offering. The submitted sample will be used for technical qualification. Sample will be analysed for geometrical accuracies, surface roughness and Oxygen content in the build. The build quality should be equal or better than criteria mentioned in section and described below:

a. Porosity: 0.2% or lower
b. Surface Roughness (in as deposited condition): 35μm or lower
c. Geometrical Accuracy: +/- 0.2mm or better
d. Oxygen content in the built component must be lower than 0.15%

15.6 OEM is required to submit a letter of commitment at the time of quote for supply of spares, tool, and consumables and also for efficient and prompt after sales service of the equipment for a minimum period of 10 years after the guarantee/warranty period under mutually agreed terms and conditions.

15.7 The bidder shall provide the details of Service Centres and also the details of the on-site service support agency preferably with OEM trained engineers including the service personnel details, training and infrastructure to support the spares, maintenance and calibration of the complete system and sub-systems after commissioning, during and after the guarantee/warranty period.