"Grand Challenge on Most Profitable 3D printing Business"

Centre of Excellence in Additive Manufacturing
CMET, Pune

Centre of Excellence in Additive Manufacturing [CoE AM] announces Grand Challenge for "Most Profitable 3D printing Business"

1. Background

CoE AM is a Ministry of Electronics and Information Technology (MeitY), Govt. of India initiative to cater to the Additive Manufacturing R&D needs in the field of Optoelectronics Sector. CoE AM has been initiated at Centre for Materials for Electronics Technology (C-MET), Pune with its partner Central Institute of Petrochemicals Engineering & Technology (CIPET), Bhubaneswar in 2019.

To accelerate economically viable technology development, CoE AM is introducing a Grand Challenge for the most profitable business case for digital toys using 3D printing in India. The scope of the grand challenge is development of working 3D printed prototype as per given specifications and preparation of business case report as per specified format.

2. Aim

To conduct ICT Grand Challenge which will produce accelerated output for research topic "Most profitable business case for Digital Toy using 3D printing in India".

3. Additive Manufacturing Grand Challenge Statement

Toy manufacturing is heavily dependent on various technologies of moulding (injection moulding, blow moulding, rotary moulding etc) of plastic parts in India. The capital cost of machinery, material cost, manpower cost, recurring mould cost among other issues are making India under competitive as compared to its international competitors in the Indian market. 3D printing is an alternative viable next-generation technology with many advantages over moulding technologies such as no recurring mould cost, better market resilience, lower capital cost per machine etc. The profitability of any business requires full assessment of a manufacturing plant and it varies over time with the movement of demand, supply and

production cost. Through this challenge, a benchmark on the most profitable 3D printing business for digital toys will be established for FY2021-22 in India. Further, this business model will help to create economically viable technology for optoelectronic components using 3D printing under CoE AM at CMET, Pune.

The challenge is divided into two parts:

(A) Development of a 3D printed working prototype using Fused Deposition Modeling (FDM) or Digital Light Processing (DLP) with specifications given in Appendix-I. The participants need to submit videos (via YouTube link) of working prototypes along with its design (STL file). Also, data for table 7 below needs to be submitted in 'pdf' form.

(B) Preparation of business case for the prototype in the format given in Appendix-II. The report needs to be submitted in 'pdf' and 'word' format.

4. Eligibility Criteria

Any Indian Academia, National Laboratories, Consultancy firms and Industry can apply either alone or in consortium. Academic institutions must be recognized by competent Central Government or State Government authorities. Industry must be registered in India under Companies Act.

5. Implementing Agency

The implementing agency will be CoE AM, CMET Pune.

6. Evaluation Methodology

Blind Review: An Expert Panel (EP) will evaluate the proposals as per para 7 and will finalize 5 top teams.

Interview: The EP will conduct interviews for top 5 teams and finalize the winner for the Grand Challenge Award.

7. Evaluation Parameters and quantifiable matrix

No	Parameter	Description	Marks (out of 100)
1	Feasibility	Working Prototype	5
		Adherence to Indian Standards (BIS, RoHS & performance standard)	3
2	Novelty	Number of printing parts	5
3	Cost	R&D Cost	2
		Cost benefits as compared to moulding technology	5
5	Business Case	Supply Chain (material, machine, process) localization with industry name and address/contact (Mobile)/email	10
		Profitability (Full Financial Forecast) as per Appendix-II	60
		Time to market	5
6	Integration	Degree of integration possible with Indian supply chain	5

8. Duration of Grand Challenge

Submission last date: 31st December, 2021 (revised date)

Blind Review result: 5th January, 2022

Declaration of winner: 17th January, 2022.

<u>KINDLY NOTE:</u>

<u>Since the submission date has been extended, the participants can resubmit their proposals if they wish to make any changes. In doing so, the previous proposal will be discarded and the new proposal will be considered as final submission. If participants do not wish to make any changes, the proposal already sent by them will be considered as final submission.</u>

9. Budget Table Format

<u>CoE AM contribution</u>

(Rs Lakhs)

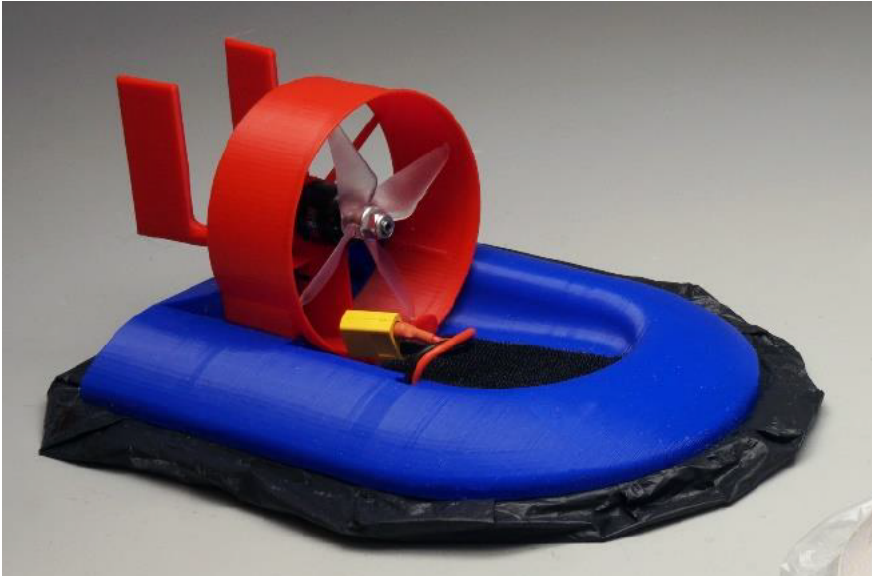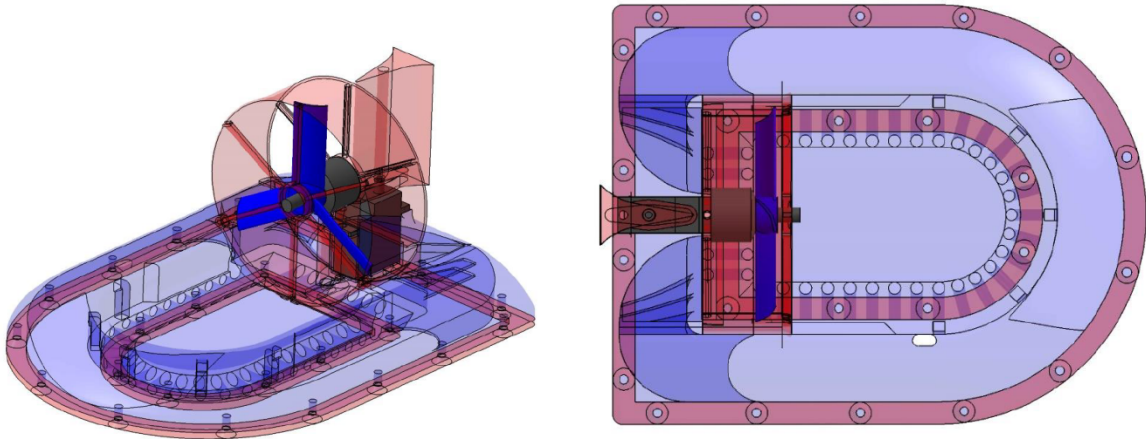| No	Budget Head	Fund
1	Award Amount	2.00
2	Logistical expenses	0.50
	Total	2.50

Grand Total: Rs 2.50 Lakhs

10. Rule and Guidelines

a) All participants and team have to be eligible (See Eligibility Criteria) to participate.

b) During the Challenge, the Team Leader shall be considered as the Single Point of Contact for all engagements & communication by the CoE AM. Furthermore, the Team Leader cannot be changed during the course of the Challenge.

c) The Team Leader and Team Members will be required to provide working E-mail IDs and Mobile numbers for the purpose of Registration.

d) Teams shall maintain detailed documentation of their Idea, Prototype and Solution at all stages of the Challenge for reference and record purposes.

g) Teams are not allowed removal/ voluntary withdrawal of team members at any stage.

h) All teams will retain any IPR for their intellectual contribution as per Indian Laws and will sign MoU and NDA with CoE AM for sharing of IPR (if any) for further use.

j) The solution should not violate/breach/copy any idea/concept/product already copyrighted, patented or existing in this segment of the market. Legal liability of such infringement will be the sole responsibility of the applicant team.

k) Anyone found to be non-compliant of rules and guidelines may get their participation cancelled.

l) For any dispute redress, Secretary (MeitY)'s decision will be the final verdict on the matter.

*****

Product: Electronics Hovercraft

Product Design:

Product Specifications:

No	Parts	Specifications	Remark
1	3D Printed Parts		
	1.1 Main Fuselage	https://drive.google.com/drive/folders/1z9kNX5eUSqAktLGs olUvH07oI6qENPsL?usp=sharing	
	1.2 Motor Propeller Duct		

	1.3 Rudder		
	1.4 Skirt Clamper		
2	Electronics Parts		
	2.1 Brushless Motor	DYS 1407 3600 KV	
	2.2 Electronic Speed Controller	T-Motor ESC 2-4s 30A	
	2.3 Rudder Servo	HK 992 MG; HK 933 MG	
	2.3 Voltage regulator 5V	5V 3A	
	2.4 Rechargeable Battery	11.1 V 3s 800-1000 mAh	
	2.5 Transmitter/ Receiver	3 channel or more	
3	Mechanical Parts		
	3.1 M3x6 Countersunk bolts	24 pcs	
	3.2 M3x30mm Countersunk bolt	1 pcs	
	3.3 XT60 connector	1 pcs	
	3.4 Servo extension 150mm	1 pcs	
	3.5 3inch drone propeller	1 pcs	
	3.6 Skirting Material & Design	https://drive.google.com/drive/folders/1z9kNX5eUSqAktLGs olUvH07oI6qENPsL?usp=sharing	

Redesigning to reduce the number of 3D printed parts and material optimization for cost reduction is allowed without change in shape and size of the product.

Format of Detailed Proposal

1 The basic details/documentation

     i.   Name and location

     ii.   Nature of activity and products

     iii.   Annual production capacity in numbers

     iv.   Scale of investment (also in terms of net fixed)

     v.   Projected performance after proposed intervention (in terms of production, export/domestic sales and direct/indirect employment etc.)

     vi.   Diagnostic study/comparative advantage benchmark survey (main findings) as compared to injection moulding.

     vii.   Implementation schedule; structuring of new company, such as copy of certificate of incorporation, articles of association and letter of agreement with stakeholders

     viii.   Revenue generation mechanism

     ix.   Project highlights--total cost of project, contribution, debt-equity ratio, repayment schedule and estimated debt service coverage ratio (DSCR), annual estimated income, expenditure, gross and net profit at expected/optimal levels of operations, break-even (BE)/internal rate of return (IRR) calculations, payback period etc.

2.   Elements of DPR

2.1   Plant and machinery

    (a) List of Plant and Machinery

Sr. No.	Particulars of plant and machinery	No.	Power requirement (HP/KW)	F.O.R. Price (Rs)	Name of proposed suppliers	Delivery Schedule (month-wise)

Note: Add central sales tax, packing and forwarding charges (2%), transit insurance (1%), and freight (2%) to costs or actuals.

(b) Capacity of plant and machinery on single shift basis

(c) Production pattern

2.2 Annual requirement of raw materials and consumables at 100% capacity utilization

Sr. No.	Particulars of raw material	Specifications/ indigenous/ imported	Quantity required at full capacity	Unit price (Rs.)	Total value (Rs.)

2.3 Utilities and services at full capacity utilization

(a) Power for industrial purpose

Sr. No.	Particulars of the machinery	KW	No. of working hrs. per month	KW/month	Rs./ KWH	Total

(b) Power requirement for commercial/ domestic purpose

(c) Water

(d) Gas/Oil/ Other utilities

2.4 Site Development and civil construction

	Particulars	Quantity/ nos	Rate	Cost
i	Cost of land			
ii	Development cost of land			
iii	Cost of compound wall			
iv	Cost of fabricated gates & grills			
v	Cost of shed			
vi	Cost of laboratory			
vii	Other RCC construction			
ix	Water tank/ Overhead water tank			
	Total			

2.5 Organizational setup and manpower requirement

Sr. No.	Category/ Designation	No. of persons	Salary per month (Rs)	Total salary (PM)

Note: Add 25% towards fringe benefits and 5% annual increment

2.6   Project cost

	Particulars of cost	Amount (Rs.)
(i)	Land & site development	
(ii)	Building	
(iii)	Plant and machinery (cost of plant and machinery, 10% installation, electrification and commissioning)	
(iv)	Misc. fixed assets (fixture, furniture, fire fighting equipment, first aid equipment, backup power supply, etc.)	
(v)	Preliminary expenses (diagnostic study, DPR, legal & administrative expenses, telephone, stationery, etc.)	
(vi)	Pre-operative expenses (establishment, travel, interest on borrowings, committed charges during construction period, start up expenses, etc.)	
(vii)	Provision for contingencies (2% building and 5% on plant and machinery)	
(viii)	Margin money for working capital	
Total		

2.7   Means of finance

Sr. .No.	Agency	Amount (Rs. lakh)	% of the project cost
1.	Private Equity		
2.	GoS		
3.	GoI		
4.	Bank Borrowings		
5.	Others		
	Total		

2.8   Working capital and margin money (actual capacity utilization year wise)

Sr. No.	Particulars	No. of months	Margin	as per capacity utilization		
				1st year	2nd year	3rd year
1.	Raw material and consumables					
2.	Utilities	1				
3	Working expenses (salary of manpower)	1				

4.	Works in process (cost of raw material, utility and salary on actual)					
5.	Stock of finished goods (cost of raw material, utility, salary, factory overheads on actual)					
6.	Bills receivables (Sales value)					
	Total					

2.9 Cost of production (Projection for 10 years of operation in tabular form)

       (i)   Raw materials and consumables

       (ii)   Utilities

       (iii)   Wages and salary

       (iv)   Repairs and maintenance

       (v)   Insurance

       (vi)   Administrative and factory overheads

       (vii)   Selling expenses

       (viii) Annual Cost of production per Kg

2.10 Estimation of profitability (projections for 10 years of operation in tabular form)

       (i)   Installed capacity

       (ii)   Number of working days (single shift basis)

       (iii)   Capacity utilization

       (iv)   Production (in single unit)

       (v)   Sales realisation

       (vi)   Cost of production

       (vii) Gross profit[(v)-(vi)]

       (viii) Financial expenses

(a) Interest on bank borrowing

(ix) Depreciation on written down value method (as per separate schedule to be attached for different categories of fixed assets)

(x) Preparatory expenses not written off

(xi) Operating profit [(vii) – {(viii) + (ix) +(x)}]

(xii) Tax vide separate schedule

(xiii) Profit after tax[(xi)–(xii)]

(xiv) Available surplus [(xiii) +(ix)]

2.11 Cash flow statement (projections for 10 years in tabular form)

(A) Sources of fund:

(a)Gross profit less depreciation (straight-line method)

(b)Term loan (TL)

(c)Subsidy/Grant

(d)Promoter's contribution

(e)Increase in bank borrowings

(f) Depreciation (Straight line method)

(B) Disposal of funds:

(a)Preliminary & pre-operative expenses

(b)Capital expenditure

(c)Increase in working capital

(d)Interest on term loan

(e)Interest on bank borrowings

(f) Decrease in term loan

(g)Taxes

(C) Opening balance of cash in hand or at bank [sum total of{(A)-(B)}]

(D) Net surplus/Deficit

(E) Closing balance of cash in hand or at bank

2.12 Debt Service coverage ratio (Projections for 10years)

$$DSCR = \frac{Net\ Profit + Interest\ (TL) + Depriciation}{installment\ (TL) + interest\ (TL)}$$

2.13 Balance sheet & P/L account (projection for 10years)

$$Break\ Even\ Point = \frac{Fixed\ Cost}{Contribution\ (Sales - Variable\ Cost)}$$

3 Commercial Viability: Following financial appraisal tools will be employed for assessing commercial viability of the project:

(i) **Return on Capital Employed (ROCE):** The total return generated by the project over its entire projected life will be averaged to find out the average yearly return. The simple acceptance rule for the investment is that the return (incorporating benefit of grant-in-aid assistance) is sufficiently larger than the interest on capital employed. Return in excess of 25%is desirable.

(ii) **Debt Service Coverage Ratio**: Acceptance rule will be cumulative DSCR of 3:1 during repayment period.

(iii) **Break-Even (BE) Analysis:** Break-even point should be below 60 per cent of the installed capacity.

(iv) **Sensitivity Analysis**: Sensitivity analysis will be pursued for all the major financial parameters/indicators in terms of a 5-10 per cent drop in user charges or fall in capacity utilization by 10-20 per cent.

(v) **Net Present Value (NPV)**: Net Present Value of the project needs to be positive and the Internal Rate of return (IRR) should be above 10 per cent. The rate of discount to be adopted for estimation of NPV will be 10 per cent. The project life may be considered to be a maximum of 10 years.