

**Title:** Advanced Cementitious Composites for 3D Printing (ACC3DP)

**Duration:** April 2020 to March 2025

**Deliverables:**

1. Creation of laboratory-scale facility for 3DCP
2. Advanced cementitious composites for 3DP
3. Material models considering rheological parameters
4. Interlinking of micro-structural properties with macro-level properties
5. Construction of formwork-free shell structures using 3DP
6. Guideline for material selection for 3DP based on microstructural properties
7. Demonstration of large-scale construction using 3D printer

**Significant Achievements:**

1. Established a gantry-based lab-scale 3D concrete printer with programmable extrusion system and XYZ movement.
2. Developed a range of cementitious mixes (30–120 MPa), including OPC, geopolymers, and hybrid systems using industrial by-products.
3. Developed time-dependent rheological models incorporating yield stress, thixotropy, and viscosity evolution; validated with experiments.
4. Executed pilot printing of wall segments and utility structures using project-developed mixes
5. Publications
  - SCI Papers: 16 No.s -Cumulative Impact Factor (SCI): 62.374
  - Non-SCI Papers: 3 No.s
  - International Conference Paper: 9 Nos
  - Research Reports: 21 No.s

**Leader & Team:**

Dr. P.S. Ambily, Senior Principal Scientist, Project Leader

Dr. Prabhat Ranjan Prem, Principal Scientist

Shri. V. Srinivasan, Senior Principal Scientist

Dr. S. Maheswaran, Senior Principal Scientist

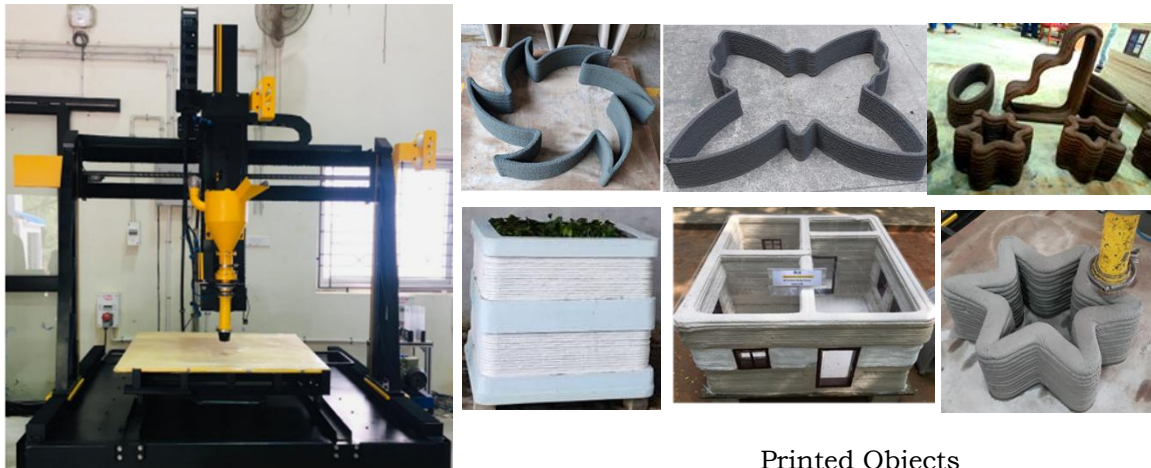
Shri Vijaya Bhaskara, Principal Scientist

Dr. K. Senthil Kumar, Senior Scientist

Dr. B. H. Bharatkumar, Chief Scientist (till January 2024)

### Details of new facilities created:

1. Extrusion based Concrete 3D printing facility
2. Rheometer facility
3. Acoustic Emission Test Facility
4. Accelerated Carbonation Facility
5. High Temperature Muffle Furnace



Printed Objects

Extrusion based 3D concrete printer

### Demo structure – Construct 3D PrintPod

