Automated In-Process Quality Control of Recycled Filament Production and FDM Printers, Phase I

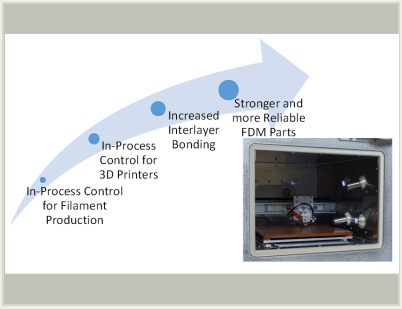
Completed Technology Project (2018 - 2019)

Project Introduction

Cornerstone Research Group Inc.'s (CRG) demonstrated expertise in polymer AM materials development, systems engineering, and feedstock recycling for ISRU offers NASA the opportunity to obtain AM process monitoring and control systems for online quality control of feedstock production and printed parts. CRG's proposed approach applies sensors, hardware, and software algorithms to monitor and adjust feedstock production AND printing processes in real time as well as certify feedstock and print quality. Hardware and software developed on this program by CRG will be integrated into systems already being developed to support NASA's ISM on complimentary efforts. CRG's proposed approach will initially be applied to FDM feedstock production and print quality, but is applicable to other AM processes using the same control hardware and software with different sensor inputs.

Anticipated Benefits

- Improvements to the Refabricator multi-material recycler printer system
- Volumetric consolidation of ISS waste plastics
- Recycling ISS waste plastics into 3D printable filament
- Reduce payload needs for AM fabrication in-space
- In-situ monitoring extensible to metal additive manufacturing
- Novel 3D printing feedstock materials
- Improved consumer-level FDM feedstock production
- In-situ filament fabrication monitoring and corrective feedback add-on
- In-situ print quality monitoring
- 3D printers with improved or tailorable layer-to-layer adhesion



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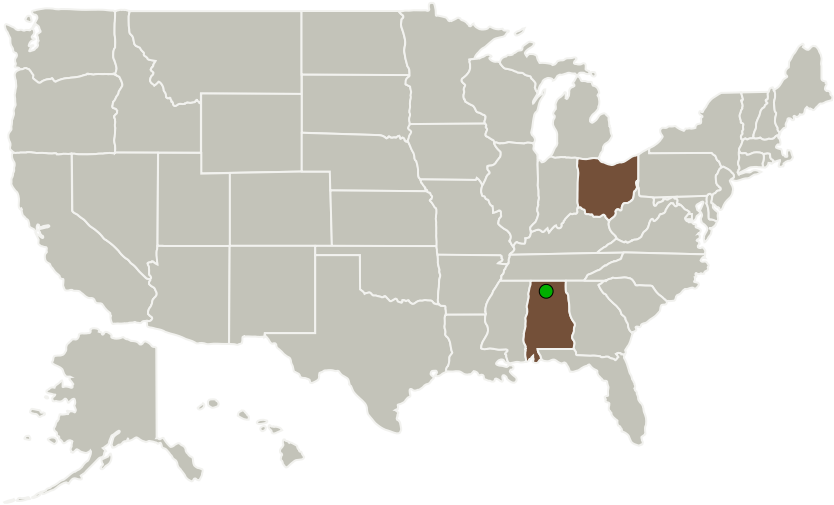
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140942)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornerstone Research Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Ryan Snyder

Co-Investigator:

Ryan M Snyder

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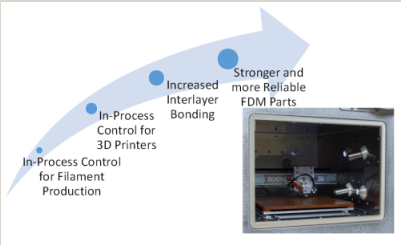
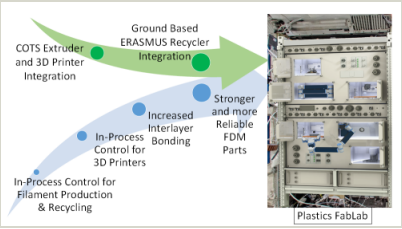
Images



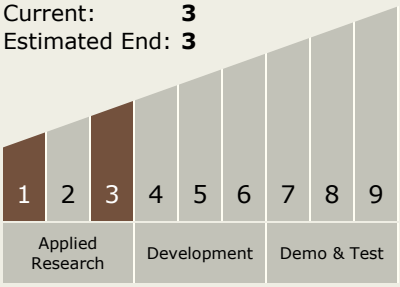
Briefing Chart Image
Automated In-Process Quality Control of Recycled Filament Production and FDM Printers, Phase I
(https://techport.nasa.gov/image/136552)



Final Summary Chart Image
Automated In-Process Quality Control of Recycled Filament Production and FDM Printers, Phase I
(https://techport.nasa.gov/image/129103)

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  └ TX12.4 Manufacturing
    └ TX12.4.1 Manufacturing Processes

Target Destination

Earth