Supplementary Material.

In-line monitoring of the Fused Filament Fabrication additive manufacturing process by non-destructive methodologies.

Progress in Additive Manufacturing

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1. CTAn processing path to allow for CTVol rendering of the Micro-CT results.

2. Thresholding (Ultimaker): Global output to image 40-255.
3. Despeckle: Sweep all except the largest object in 3D space.
4. Despeckle: Sweep all except the largest object in 2D space.
5. Bitwise operation: ROI = COPY Image
6. Despeckle: Remove black speckles with volume less than 100 voxels applied to ROI in 3D space.
7. Despeckle: Remove black speckles with area less than 15 pixels applied to ROI in 2D space.
8. Bitwise operation: Image NOT Image
9. Morphological operations: Closing applied to image in 3D space with a hexagonal kernel with a radius of 2.
10. 3D model: Apply to image with a Double time cubes algorithm exporting as a CTM.
11. 3D analysis: Basic values and additional values.

2. DSC Ultimaker PLA Printed and Filament

The tests were run on a Perkin Eimer DSC 8000 using Pyris Manager Software to capture the data. All samples were weighed prior to the testing with masses between 10-20mg using a Sartorius M-Power Balance and the tests were conducted in a Nitrogen purging atmosphere of 40ml/min. The printed sample tested was printed under the "Normal" default printing conditions and the unprinted

samples were taken directly from the filament spool. The samples were heated with the following program:

1) Heat from 20.00°C to 180.00°C at 10.00°C/min (Heat 1)

2) Cool from 180.00°C to 20.00°C at 10.00°C/min

3) Heat from 20.00°C to 180.00°C at 10.00°C/min (Heat 2)

	Tg (°C)	Tm (°C)
Unprinted Sample C Heat 1	67.058	154.791
Unprinted Sample C Heat 2	64.958	154.708
Printed Sample C Heat 1	66.254	156.083
Printed Sample C Heat 2	65.158	155.033