Vertical Bunsen Burner Testing of 3-D Printed Material

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By: Steve Rehn
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Introduction

• Test solid 3-D printed material in Vertical Bunsen Burner
• Nylon-12 material
• 12” × 3” × 0.060” Samples
• 12” × 3” × 0.10” Samples
• Printed in 3 orientations
  – Flat (XY), Sideways (YZ), and Standing (ZX)
Nylon-12 – 0.060 inch

XY-Direction

YZ-Direction

ZX Direction
Nylon-12 – 0.10 inch

XY-Direction  YZ-Direction  ZX Direction
Printing Orientations

- 3 orientations
- 2 thicknesses
  - 0.060” (~1.5 mm)
  - 0.10” (~2.5 mm)
- 0.10” slice height
- 0.20” printing width
Nylon-12

- Toolpath of 3-D printer printing at different thicknesses
- Printing in XY-direction produces an identical cross-section no matter the thickness
- YZ and ZX direction have more cross-hatching inside with thicker samples
Nylon-12

- Drip flame time was difficult to measure because there were several drips that fell on top of each other
- Flames extinguished because of dripping
- Burn length wasn’t accurate because of the large amount of samples that had to be manually extinguished.
0.060 inch Nylon-12 12 Second Vertical Bunsen Burner

Flame Time (s)

XY Direction

YZ Direction

ZX Direction

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Vertical Bunsen Burner Testing
• XY-direction did not self-extinguish the most for both thicknesses
• Cross-hatching pattern doesn’t drip as easily leaving the sample in place to burn
Conclusion and Future Work

- **Nylon-12 showed some difference in printing orientation**
  - XY-direction was most severe case for this material
- **Could test 0.10 inch Polycarbonate material with different printing orientations**
  - 0.060” behaved similarly to Nylon-12 but didn’t show any difference between printing orientations
- **Need to test different infill % next**
  - Compare to Airbus testing of Ultem 9085
Questions?

Contact:
Steven Rehn
Federal Aviation Administration
William J. Hughes Technical Center
Fire Safety Branch, Bldg. 203
Atlantic City Int’l Airport, NJ 08405
(609) 485-5587
steven.rehn@faa.gov