**Table 4 - Extruded Filament Length at Varying Speeds**

**Data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| MELT | DRIVE | DIAMETER | ORIFICE | MATERIAL | TEMP | LENGTH |
| Volcano | Direct | 1.75 mm | 1.2 mm | PLA | 190 C | 50 mm |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Flow Rate (mm3/min)** | **Speed**  **(mm2/min)** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** | **Avg.**  **Value** | **Deviation**  **Avg. Value** |
| **200** | 83.15 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **400** | 166.30 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **600** | 249.45 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **800** | 332.60 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **1000** | 415.75 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **1200** | 498.90 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **1400** | 582.05 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **1600** | 665.20 | 1 | 1 | 2 | 1 | 2 | 1.4 |  |
| **1800** | 748.35 | 2 | 2 | 2 | 2 | 2 | 2 |  |
| **2000** | 831.50 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| **2200** | 914.65 | X | X | X | X | X | 3 |  |
| **2400** | 997.80 |  |  |  |  |  |  |  |
| **2600** | 1080.96 |  |  |  |  |  |  |  |
| **2800** | 1164.11 |  |  |  |  |  |  |  |
| **3000** | 1247.26 |  |  |  |  |  |  |  |

**Notes/Observations:**

* Spring Tension: (~58.70 mm for 3mm) (~58.90 mm for 1.75mm)
* At 665.2 Minor Threading begins to occur near the end of extrusion around a 10mm patch.
* At 748 the maximum threading occurs because this is the maximum speed at which the motor can push the filament through. Threading occurs near last 25mm and continues if extrusion length increased.
* At 831 clean trials occurs because the motor has gone past its actual limit so it extrudes as if it is extruding at a lower speed. This is proven by the grinding noise of the motor and the twitching suggesting that it is skipping steps.
* Failure mode occurs at 914.65, and severe motor grinding noise is heard, and motor gears move very slowly suggesting that failure is in lack of motor power to push the filament through.

**Specifications:**

* 1.75mm Unknown red PLA filament
* 1.2mm E3D Volcano nozzle

**Failure Mode:**

* 1: Best extrusion
* 2: Grinding Noise, skipping (minor)
* 3: Severe grinding, motor moves very slow(major)
* X: Complete failure, does not extrude at all (fail)

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