**Table 7 - Pulled Filament Length at Varying Temp’s**

**Data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| MELT | DRIVE | DIAMETER | ORIFICE | MATERIAL | Flow Rate | LENGTH |
| Volcano | Direct | 1.75 mm | 1.2 mm | PLA | 2200mm^3/s | 50 mm |

|  |  |
| --- | --- |
| **Temp Celsius** | **At Flow Rate of 2200** |
| **240** | 9.28mm |
| **250** | 16.34mm |
| **260** | 18.48mm |
| **270** | 20.50mm |

Rate of pulled filament/increase in temperature is .374mm/C

**Summary:**

* After noticing that at the failure rates less than the specified filament was pulled, we decided to measure the pulled filament at the failure flow rate as the temperature was increased.

**Notes/Observations:**

* Spring Tension: (~58.70 mm for 3mm) (~58.90 mm for 1.75mm)
* We noticed that as the temperature increased the motor grinding noise became noticeably less audible.
* The pulled filament length increased by about 10mm from 240 all the way to 270. The explanation for the lack of filament being pulled has a two-fold explanation. First, the motor is reaching its maximum speed so the torque is decreasing thus it can no longer exert the force to drive the filament and begins stepping and no filament comes out. The second explanation is that the since the filament is moving so fast through it’s not actually heating to its necessary 240 degrees. Thus, since it is partially stiff it cannot be extruded easily and hence the increasing temperature allows for it to be extruded more easily and the trend shows this as the pulled filament length increases as the temperature increases.
* An important observation is that the pulled filament by increase in temperature rate for ABS is 3 times the size of that for PLA. The reason for this probably occurs to higher thermal conductivity. Although ABS has a higher thermal conductivity thus its atoms are closer together and can transfer heat quicker, it also has higher melting point due to this increased density. Thus, after it has melted the higher thermal conductivity plays a bigger role because while both have the same failure flow rate, ABS with increases in temperature is better able to alleviate this.

**Specifications:**

* Yellow Octave ABS 1.75mm
* 1.2mm orifice, E3D volcano

**Failure Mode:** Not applicable for this trial.