Abstract

The 3D printing industry has seen rapid growth in the last 10 years and has been called the next industrial revolution. There are several different processes used in 3D printing, but the most popular process is called Fused Filament Fabrication (FFF) or Fused Deposition Modeling (FDM). This is the process where (most commonly) plastic filament enters a nozzle, is heated to a semi-liquid state, and then deposited into a pattern to create a print. One major drawback to this process is that the prints are anisotropic. This means that the strength of the part varies on the orientation that it was created. This project experimented to determine if a proposed post processing method would decrease the anisotropy in the FFF process. The proposed process involved using a high intensity lamp to flash the print after each layer is printed. The theory was that this would decrease the gap between deposited filaments and from research this was a proven way to make prints stronger.

For this project, a Xenon Sinteron 2000 was used as the high intensity lamp and a Printrbot Simple Metal Plus was used as the 3D printer. Three experiments were done to determine if the Sinteron would be successful in reducing the gap between deposited filaments. The first experiment was done by flashing the surface of completed prints and then using a portable microscope to measure the height of the surface layer and necking between deposited filaments. The data were analyzed using a two-way ANOVA and the results did not conclude that the Sinteron was successful in reducing the gap. The second experiment was analyzed visually using an optical microscope and revealed that Sinteron might be able to reduce the gap on parts that are solid. The third experiment was analyzed using an optical microscope and the area of the gaps were measured using ImageJ software. The results concluded that the Sinteron was not successful in reducing the gap.

The quantitative data from these experiments suggest that the proposed processing method would not be successful in reducing the anisotropy of 3D printed parts created by the FFF process. The recommendation is to investigate post processing methods such as a heat gun that would apply heat evenly across a layer.