Project Name – Decorating Synthetic Wood with Ink-jet Printing Using UV Curable Inks

Overview
This project is to develop a technique to directly print on the synthetic wood material in a single pass during the extrusion process. The objective is to develop an ink jet head which can be applied with the ultraviolet curable inks. The ink jet head should not raster but instead it should match the printing speed of the extrusion process. The start of the printing cycle should follow the completion of the previous cycle and thus the pattern will be continuous.

Objectives
1. The prototype should print ultraviolet curable ink in a wide format of 100 mm across and the printhead must not raster
2. The printing speed must match an encoder signal from the extrusion process.
3. The start of a printing cycle must immediately follow the completion of a previous cycle, creating an unbroken printed pattern on the profile surface.

Approach
• The Highwood LLC 1 team designed a prototype consisting of an array of piezoelectric print-heads controlled by an Arduino microprocessor and regulated with a rotary encoder. In our prototype, one such print-head was programmed for printing.
• The printing speed is variable in accordance with the extrusion speed of the wood. The prototype is able to be powered by a standard electrical outlet in combination with a standard USB supply. The Rotary Encoder is connected with a 3D printed 50mm diameter wheel that is in constant contact with the moving wood. This enables us to accurately calculate the extrusion speed.
• The system is able to operate on wood types of many different thicknesses. The print head as well as the rotary encoder are able to be adjusted vertically while still functioning as intended with the aid of 3D printed movable parts.

Outcomes
1. This prototype performs all of it's needed functionalities when it is finished. It prints uninterrupted and undistorted patterns onto a constantly moving piece of synthetic wood. The printing speed matches the speed of the wood which is constantly changing.

2. Before this project, any addition of aesthetic patterns to the wood required a secondary process. This means that someone from the factory must physically apply a separate process to the synthetic wood which takes a considerable amount of extra time. After this project, the only thing that workers will have to do is load new patterns onto the printing device and refill the ink cartridges.
3. We will be able to save approximately $7200 at least. We reach this approximation as our printhead costs $300, whereas a Kyocera printhead costs about $7500.