

Senior Design Project Description

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| Company Name | Mammoth Machine and Design – Cornelius, NC | Date Submitted | July 19,2017 |
| Project Title | Stippling Machine Design (MAM_STIPPL) | Planned Starting Semester | Fall 2017 |

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

| Discipline | Number | Discipline | Number |
|-------------------|---------------|-------------------|---------------|
| Mechanical | 4 | Electrical | 1 |
| Computer | 1 | Systems | |
| Other: | | | |

Project Overview:

Mammoth Machine + Design specializes in CNC machining, engineering design and product development. The objective of this project is to design and build a stippling machine. Stippling is the process of marking a surface with shapes repeatedly. This technique is commonly used in art and in the modification of surfaces for increased friction. This surface modification technique has gained popularity among gun owners who want to increase the friction on their grip. To do this, a head of a certain shape (see Figure 1) is used to locally melt and form the polymer grip into a high friction surface (see Figure 2). To date, this technique is predominantly done by hand or by laser ablation.



Figure 1: Stippling Head on Solder Iron



Figure 2: Hand Stippling a polymer surface.

The objective of this design project is to design a machine that can stipple a polymer surface of arbitrary shape.

Initial Project Requirements:

Students will be required to design a machine that can automatically stipple a surface based on a geometric input. The supporter will help with the control and the generation of the tool paths as well as the specification of the geometric input of the part surface to modify. It will be the primary responsibility of the team to design the required machine architecture and select hardware to kinematically reach the desired surface at either the normal to the surface or at an offset angle to the surface with a heated tool on an articulated head. The tool head design (for the stippling pattern) will be part of the scope for the project.

Expected Deliverables/Results:

- Kinematic machine design
- Selection of hardware to realize machine kinematics
- Selection of hardware to realize machine actuation
- Selection of machine control (Mach4, LinuxCNC, TinyG, Grbl, etc.) to implement motion
- Prototype machine

Disposition of Deliverables at the End of the Project:

Hardware produced should be returned to the Sponsor at the conclusion of the May Expo

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- Proficiency with CNC software a plus
- Proficiency with programming a plus