Rapid prototyping Challenges in Manufacturing Molds for Domestic Applications

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Abstract

This paper presents a study of the challenges of using rapid prototyping for mold design and manufacturing of domestic applications. Rapid prototyping equipment presents a variety of challenges related to machine parameters, raw material, and product design, that combined represents a complex environment that can significantly affect delivery time, quality of the product, and cost. A study has been conducted to identify these challenges to build a methodology to train future users. This study consisted of identifying information related to the product such as material chemical, mechanical, and manufacturability properties as well as information about functionally and final application. Literature review shows other processes used in manufacturing the specific product affect the finished product. This information is combined with the equipment information like process parameters and capability of the equipment. Preliminary results show that melting point of the material significantly affect the manufacturability of the product and that combined with the functionality of the product impact the number of layers to be considered for the manufacturing of the product. Future research is focused on conveying a design of experiments to find correlations between a variety of materials and process parameters and their impact to the quality of the finished products.

Introduction

- The Leyendecker Center(PSRC) was producing soap using the byproducts of biodiesel production, in an effort to utilize all byproducts of agricultural production of cotton.
- Glycerin is a waste product of biodiesel production, and one of the main components of soap.
- The process currently in use by Leyendecker Center was primitive and produced a product that was not uniform in appearance, size, or weight. We produced molds using rapid prototyping to correct these flaws.

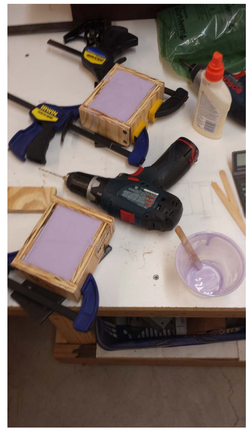
Hypothesis/Objectives/Constraints

- Design considerations for the soap include an ergonomic shape for the intended use of the product, as well as an aesthetically pleasing product to increase salability.
- The designs initially suggested included irregular shapes including the state of NM and the ‘Pistol Pete’ Aggie logo, have since been rejected.
- More uniform shape with different logos inset into the shape will be produced.
- The final mold: durable and withstand the heat of the molten soap when it is poured. The product: reusable for extended periods.

Methods

- Produce a mold using rapid prototyping for the soap process. After seeing the process used to produce the soap, we determined the molds could not be produced directly using the equipment we had
- Instead of directly printing molds, we used the Makerbot Replicator to make the desired end result shape for the soap, and used this as a plug to produce molds in a material suitable for the soap production .
- We used silicone, a durable material that can withstand over 400° F, that is also pliable and non-adhesive so that soap can easily be removed from the mold once cured.

Results

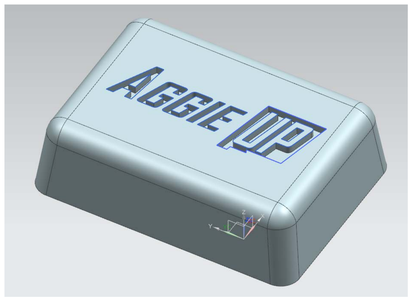


Conclusions

We used a number of low cost methods to help improve the commercial viability of the PSRC’s product, with a total cost of materials under $250. The Leyendecker Center will be able to reuse these molds through the course of their production, and the cost will be reclaimed through a higher sales volume and retail cost with the improvement of the product.

Future Research

Future research is focused on conveying a design of experiments to find correlations between a variety of materials and process parameters and their impact to the quality of the finished products.



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