**Executive Summary**

**Task:**

Reverse engineering is the process of studying a product’s form by disassembly in order to gain a concept of the product’s function. Studying each individual part, it’s function, material, and how the parts work together gives a better understanding of how the device works. The goal is to understand how the product works in order to improve or redesign. Team 1 chose to reverse engineer a Mr.Coffee 12-cup Programmable Coffee Maker. Mr.Coffee is a manufacturer of various types of coffee and tea makers, and this is one of their basic products with a low price point. Through testing the device, disassembly, analysis of parts, and materials, and CAD models, our team was able to study the functions of our device, and determine what modifications would make the product better.

**Process:**

Reverse engineering our coffee maker was accomplished in the series of steps listed below:

1. **Developing a Plan and Research:** In order to make sure that our team stayed on track and managed our time well for the project, we constructed a Gantt chart. The chart included deadlines for our phases, which were testing, disassembly, functional decomposition, CAD model drawings, powerpoint, and RE report, along with milestones such as the rehearsal and the in-class presentation. We then researched our manufacturer and their background, the coffee maker’s functions, and customer reviews of the product. We added information about the manufacturer, description of device and customer reviews to our device information memo.
2. **Testing:** The team tested the coffee maker in order to get a complete grasp on the machine’s functions and how well they worked. The team tested all the functions that the manual stated it did, which included brewing 12 cups of coffee, delay-brew, keeping coffee warm for 2 hours, removing the brew basket, and a pause ‘n serve function which allows the decanter to be removed while coffee is brewing to pour a quick cup. The team compiled their own list of pros and cons regarding the device and added them to the device information memo. The team decided that for $20 the product performs all stated functions very well, but the cord is too short, the machine is noisy, and the brew basket is hard to remove. Most consumers agreed with the same reviews the team encountered through testing, as they often had the same complaints.
3. **Disassembly:** During this step, the team disassembled the coffee maker part by part. Each part had a picture taken of it, was labeled with a number, and then was added to the bill of materials. The materials of each part were also determined along with if it is a custom or standard part. This was added to the bill of materials as well. Dimensions of all parts were recorded, and this step allowed us to realize what each part’s function was.
4. **Analyzing Function:** In this step a functional decomposition flow chart was created to show the main task, sub tasks, and sub-sub tasks of the coffeemaker, which we learned through testing and disassembly. A schematic was also constructed to show how the machine works in regard to flow of heat, electric, water, and moveable parts. CAD model drawings of all parts were constructed on Solid Edge, along with detail drawings and assembly drawings to show how the parts interact with each other.

**Conclusion:**

Overall, the coffee maker performs the basic functions stated in the user manual and brews coffee relatively well, especially for a price of $20. The coffee-maker contains functions such as pause ’n serve and delay brew with a timer that is unexpected for the low price of $20. A filter basket that is easier to remove, more quiet brewing, and a longer cord would make this product more appealing to customers.