

MCHE 201: Introduction to Engineering Design

Spring 2018 – Mini-Project 3

Assigned: Tuesday, February 20th

Presentation: Friday, March 2nd, 5pm

Report Due: Friday, March 2nd, 5pm

Assignment: Dissection and design analysis of an Oral B electric toothbrush.

The design analysis should be reported in no *more* than 3 pages of text, excluding figures. In addition, a presentation reporting on this project will be given.

Submission: The report and presentation should be submitted via email:

- to joshua.vaughan@louisiana.edu
- with subject line TeamX-MCHE201-MP3 where the X in TeamX is your team number, and
- all team members copied on the submission email.

The email should include:

- a single pdf of the report with file name TeamX-MCHE201-MP3.pdf where the X in TeamX is your team number, and
- a link to your team's presentation on vimeo.

Note: Submissions with incorrect filenames or submitted as multiple images/pdfs will be rejected.

1 Assignment Details

1.1 In-Class Dissection

Each team will be given an Oral B electric toothbrush for disassembly and inspection; this is often called a mechanical dissection. The process of dissembling the toothbrush and some questions to take note of are included below. To reassemble, just reverse these steps. The toothbrushes should be returned in working order. Read the entire dissection process before beginning.

1. Operate the device.
 - Observe the operation of the device. What indicates how to operate the device? Are these indicators clear? Why?
 - Sketch the brush and note the brush's head motion
 - List the customer needs and engineering specifications. (Expand this list for your presentation and report.)
 - Identify the relationship between the various subsystems of the device and their interdependence.
2. Take off the brush head carefully. Do not disassemble it.
 - How was the brush head removed?
 - Was it easy to remove?
 - Is the brush head meant to be replaceable? Is this obvious?
3. Operate the device without the brush head attached. Take notes on what you observe.
4. Remove the bottom of the device by unscrewing it.
5. Remove the battery. How is which way to insert the battery indicated?
6. Remove the battery and motor subsystem. Do not disassemble it.
 - How was the subassembly removed?
 - Why are the snap fits located where they are?
 - Is this a good design? Why or why not?
7. Put the battery back and operate the subassembly.
 - Sketch and discuss observations about its operation.
 - What mechanisms are utilized to achieve device functionality? Sketch them.
8. Remove the rocker switch.
 - What happens?
 - Why?
9. Examine the motor.

- Notice the lack of wires? Why would it be designed this way?
 - What replaces them? Why?
10. Examine the metal shaft. How does its design create brush motion?

1.2 Reporting

The design analysis and suggested improvements should be reported in no *more* than 3 pages of text, excluding the abstract and figures. The report needs to present the design as is and suggest changes to improve upon it. This discussion should be grounded in an understanding (and presentation) of the customer requirements and specifications for the product.

A suggested outline for the report is attached to this document. You may also refer to Chapters 10–13 of the textbook and/or the **C.R.A.W.LAB** Style Guide, found at:

http://shared.crawlab.org/CRAWLAB_StyleGuide.pdf

Formatting requirements, a pre-submission checklist, and a report template, including a L^AT_EX source file, can also be found on the class website.

1.3 Presentation

The presentation will be submitted as a video presentation. This presentation will present an overview of the current design as well as present suggested modifications to the design to improve it. This presentation is limited to 5 minutes. Only one team member should present per team. The presentation should follow roughly the same outline as the report.

All presentations must adhere to the specifications for the video submission posted on the class website.

2 Acknowledgements

This lab is based on one developed at Georgia Tech for *ME2110: Creative Decisions and Design*, which itself was developed from work by Prof. Will Durfee at the University of Minnesota. Similar dissection projects are also known to have been conducted at The Pennsylvania State University.

Suggested Outline

Title Page

Abstract – Standalone summary of the report’s contents, on a separate page

I. Introduction

- Introduce the problem and its challenges
- End with a “roadmap” sentence outlining what is in the remainder of the report

II. Current Design

- Present the functionality of the current design
- Start with a complete system discussion and work toward detail
- Drawings with dimensions for scaling and parts labeled according to function should be included to support this discussion
- Do *not* use only pictures. You may include pictures, but they should supplement your figures, not replace them.

III. Customer Requirements

- Give concise description of the customer requirements and specifications for this product
- As support, include and discuss:
 - House of Quality
 - Specification List

IV. Design Improvements

- Present ways to improve the design
- These can be based on:
 - Your understanding of the customer requirements
 - Changes that may improve manufacturability, aesthetics, operation, etc.
- Properly labeled and dimensioned drawings of the suggested design changes should be used to support this discussion

V. Conclusions

- Summarize what was presented in the report
- *No* new information is presented here

VI. References (if needed)