Sleep Apnea Therapy Device – Progress Report #4

Client: Dr. John Webster
Advisor: Dr. Megan McClean
Team Members: Calvin Hedberg, Taylor Karns, Jen Rich, Ben Mihelich
Date: Feb 10th – Feb 16th, 2017

Problem Statement

Clinically significant sleep apnea is a sleep disorder characterized by interference of breathing during sleep. Those who suffer from sleep apnea experience interrupted sleep which develops an increased risk of heart attack, high-blood pressure, arrhythmia, stroke, and diabetes. Continuous Positive Airway Pressure (CPAP) machines are the current standard for treatment. However, approximately half of all patients suffering from sleep apnea do not adhere to it well due to complications such as nasal congestion, headaches, and continued tiredness. Continuous dead space rebreathing is an alternative that has been researched and shown to stabilize central respiratory output in patients with mild to severe obstructive sleep apnea without the complications of CPAP. Thus, our team has been assigned the task of designing and fabricating a variable dead space device based on guidelines and research conducted by our client Dr. John Webster. This includes developing an algorithm such that the device can detect sleep apnea and consequently regulate the amount of dead space for proper respiration.

Last Week's Goals

- Prepare for Oral Presentation
- Create diagrams for new proposed designs
- Begin ordering parts to begin prototyping

Summary of Team Role Accomplishments

- Calvin (Leader) - filled out the week's progress report
- Taylor (Communicator & BPAG) – none
- Jen (BWIG) – updated the team website
- Ben (BSAC) – attended BSAC meeting Feb 10th

Summary of Design Accomplishments

While brainstorming the method for operating the mechanical aspect of the dead space variability we have narrowed the design down to two possible variations. The first variation involves an external cog and a worm gear motor. The worm gear would attach to the breathing tube and turn the cog which wraps around the circumference of the tube. The cog would turn a cover that is directly attached to close and open the holes in the tube. The other variation involves having a step motor inside the tube that turns a piece around the inside circumference. This could have a single motor or two motors that would be located in adaptor pieces that have larger diameters than the rest of the breathing tube to prevent cutting off air flow. Both designs would achieve the goal of dead space variation but they differ in the method of fabrication and will each affect power consumption and durability of the overall device. The team will come to a consensus and order parts to begin fabrication this week.

The team met Wednesday (2/15/17) and Thursday (2/15/17) to create and go over the preliminary presentation. Many aspects of the background for the project were referenced from the previous semester with the new matrix and design choices updated. The team is presenting tomorrow (Friday 2/17/17) in 1164 Mechanical Engineering at the final time slot of 1:50pm.

This Week's Goals

- Order parts for prototype
- Begin fabrication

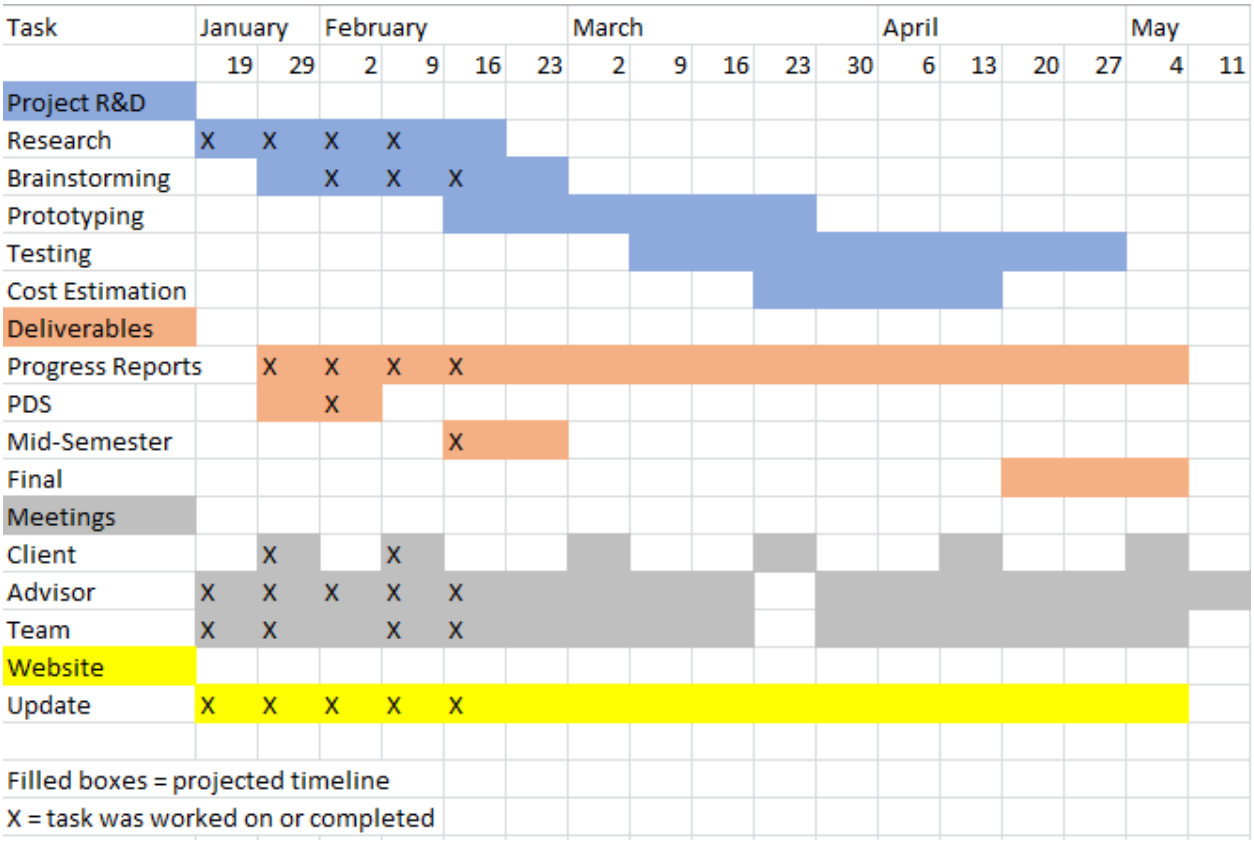
Difficulties with Project

While modeling and diagramming the proposed design we found it difficult to include some of the more complex parts involved. This left us wondering if computer models or hand-drawn modeling would be best for the presentation.

Activities

Date	Person(s)	Task	Time (hrs)	Semester Total
	Calvin			2.5
	Taylor			1.5
	Jen			2.0
	Ben			2.5
2/15/2017 2/16/2017	Team	Meeting – create preliminary presentation Meeting – edit presentation and practice as a team	1.5 0.5	7.5

Project Schedule



Expenses

None