College of Engineering
UNIVERSITY OF GEORGIA

Capstone Design Project Abstract

Project Title: System Design for Mechanical Breathing Simulator

Sponsor: University of Georgia, Dr. Pidaparti
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Faculty Mentor: Dr. Roger Hilton, Adam Wineland

There is a current need for mechanical systems that simulate human breathing. These devices are typically found in hospitals to train medical staff and in research labs. The objective of this project is to create a cost efficient, versatile, portable, and user-friendly system that delivers air mimicking human breathing that is similar to what is already on the market. Current devices are not cost effective, which limits the number of people who can be trained for laboratory testing. Additionally, in response to other challenges caused by existing ventilators on the market, which do not mimic sinusoidal breathing cycles accurately and/or efficiently, this device seeks to simulate a more human-like respiratory pattern that can account for various breathing parameters. Knowing this, we decided that an adjustable output flow to replicate different breathing patterns and characteristics will be the most successful design. Working with Dr. Ramana Pidaparti, our project is a piston-cylinder mechanism with a programmable control to adjust airflow in a way that imitates both inhalation and exhalation. The scope covers Dr. Pidaparti's lab, and the primary goal is to be a tool for data collection without the need of human subjects, which could be beneficial to other research labs as well. This product could potentially be a major factor in future research breakthroughs in terms of lung health, respiratory issue analysis, and future experimental procedures that discover different health impacts on a wide variety of people based on their lung health. This product offers a cost-effective solution for ventilator training as well as lab experimentation. It will be evaluated on our design objectives before completion, such as reliability, durability, and its accuracy.

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