A Novel 3D Printed Ventilator for COVID-19

Brar, Harjaisal (School: Stockdale High School)

High cost, proprietary parts, complex manufacturing techniques, and transport issues limited our ability to produce enough ventilators during the COVID-19 pandemic. The goal of my project was to create a novel ventilator using 3D printing technologies to increase availability of ventilators since 3D printers are widely available. Fusion360 was used to design the ventilator which was printed using TPU filament and UV resins. A 150Kv motor and an ODrive motor controller were used to control the ventilator. The ventilator was tested using a commercial test lung and a spirometer. The tidal volume and respiratory rate were recorded and compared to data from a hospital grade ventilator. The results showed that the novel ventilator performed comparably to the hospital grade ventilator. With its modular design, the novel ventilator can ventilate multiple patients at the same time. Multiple power systems allow it to work, even in areas with unreliable electric power. Since it is 3D printed, the novel ventilator is light weight, less expensive, contains no proprietary parts, and requires no complex manufacturing techniques allowing it to be mass manufactured anywhere and effectively mitigate future shortages. In the future, I would like to test this ventilator in a clinical setting and make the design more compact.

Awards Won:
Second Award of $2,000
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: On-line Mawhiba Universal Enrichment Program
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Award of $500