HEC 27: Breath

Mechanical Engineering

Ventilator Communication Interface Attachment

Team Members: Eduard Akhmedov, Sandy Ghaly, Jules Kenmoe, Fernando Rodriguez, Lucas Santos
Sponsor: Paul Seales (ESI- Ecological Services Inc.)
Advisor: Dr. Andres Garcia

Background

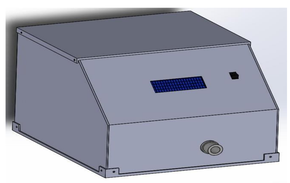
Our device will be a standalone attachment to the inspiratory line of the mechanical ventilator our sponsor created. The device will monitor parameters such at temperature, pressure, and air flowrate, which will be displayed on an LCD screen to enable physicians to get real-time information. The data may also be stored on a computer for later analysis if needed.

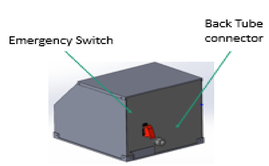
Objective

The design seeks to build and test a data management system that will attach to an inspiratory line of a mechanical ventilator and display automated data collection from the ventilator for the user.

Key Features

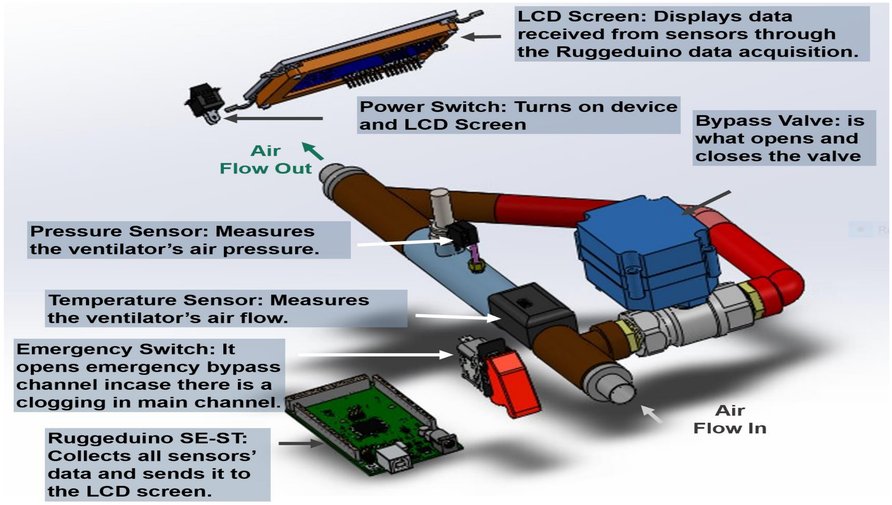
- Non-obstructive
- sensor path with the use of flow
- Emergency path with a auto and manual activation





Abstract

Modern ventilators are costly and can unexpectedly malfunction due to software issues or outdated operating systems. These issues put patients at severe risk if the ventilators are not switched off on time. As such, an economical standalone data management device has been designed and developed to monitor pressure, airflow, and temperature of the ventilator to mitigate potential risks. To achieve this, an Arduino will used to communicate with pressure, temperature, and air flow sensors. Sensors will be placed on top of a PVC pipe that intercepts with an inspiratory line from the ventilator to the patient. The information will then be displayed onto an LCD screen for physicians to observe patients accordingly. The device failure will not put patients at risk.



Specifications

Requirement	Specifications
MV Pressure support	5 to 30 cm H_2O (4.9 hPa to 29.4hPa)
Atmospheric pressure	1013.23 hPa
Sensor pressure	1042.63 hPa
Temperature range	50°F (10°C) -120°F (48.8°C) Note: Lung tissue damage can occur at prolonged exposure 45°C
Ventilator flow capacity	5 to 10Lpm (8 to 16bpm)
Inspiratory flow rate	60 to 120 L/min

Future Plans

Integrating patient data management system with the hospital information management system and enabling ventilator network connectivity (WIFI and LAN) so that patient data be accessed at different points in the hospital beyond bedside. Server room is also needed to store data storage servers and hospital computer networking devices.

Acknowledgement

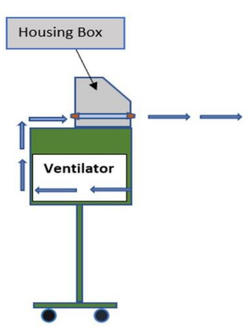
The support of the University of Texas at Tyler Engineering faculty.

- **Dr. Andres Garcia** – Director of HEC/ Advisor
- **Dr. Barakat** – Chair
- **Mr. Paul Seales** – Project Sponsor

Design Progress

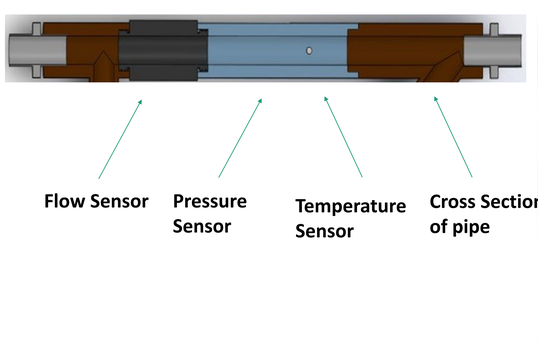
Sponsor Ventilator

Communication Interface Attachment

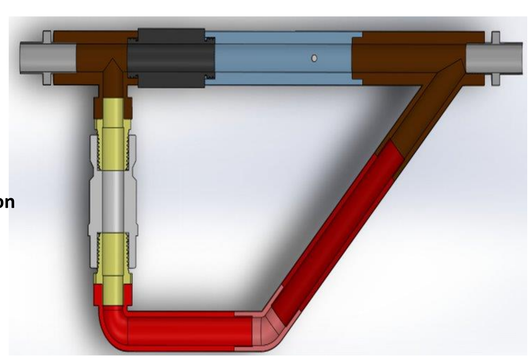


Patient

Main Channel



Emergency channel with VALVE



Interior View w/ Piping System