Team 12

Prevention of Entanglement and Tripping of Oxygen Tubing For COPD Patients

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Need:

User and Problem :

- Chronic Obstructive Pulmonary Disease (COPD) is a disease damaging the lungs or airways impeding airflow
- 65-84 year olds make up 39.6% of prevalence and are bound to in home oxygen concentrators by tubing [2]

Limitations in Solutions :

- Multiple Components, lack safety, large footprint, and non patient friendly

Objective: Develop a system to reduce entanglement and tripping of oxygen hoses for COPD patients

Figure 1. Tubing tends to self entangle and be disorganized

Design Inputs:

Constraints :

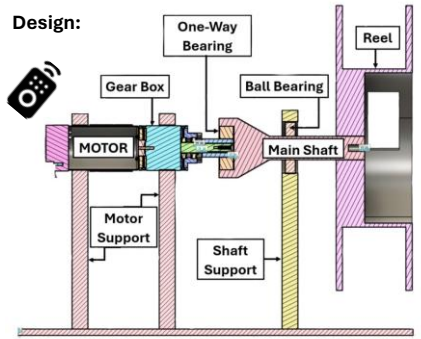
- Universal Constraints
- Interchangeable Tubing
- Less than 20 lbs
- Cost Effective

Requirements :

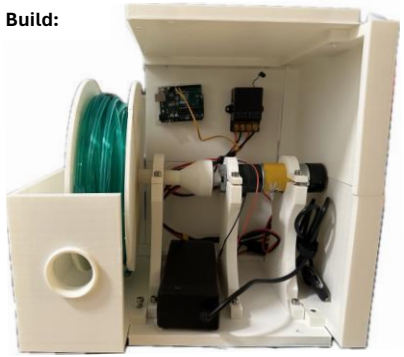
- Airflow: 1.5 ± 0.5 L/min
- Hose Width: 5 – 7 mm
- Hose Length: 4.5 - 15 m
- Speed: 0.8 – 1 m/s

Solution:

Design:



Build:



Verification:

Flow :

- Ensure proper flow (ISO-16900-8)
- Control = 1.39 L/min
- Half Coiled = 1.39 L/min = **Passed**
- Fully Coiled = 1.37 L/min = **Passed**

Figure 3. 15m tubing at 7mm within the OxyReel

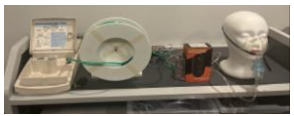


Figure 2. OxyReel Fully Coiled connected to Nebulizer

Tube Compatibility :

- Ensure tubing compatibility
- 5mm at 4.5m: **Passed**
- 7mm at 15m: **Passed**

Speed :

- Ensure motor speed is within 0.8 - 1 m/s
- Average speed = 0.91 ± 0.02 m/s = **Passed**

Conclusion:

Innovations & Impact :

- Accommodates different lengths and diameter
- Compact and Ease of use
- Allow freedom of maneuver with reduced risk
- Reduced healthcare cost [3]

Acknowledgements : Drexel School of Biomedical Engineering, Dr. Kenneth Barbee, Dr. Brian Chan, Marius Cobani

References: [1]" National Heart Lung and Blood Institute, 2021 [2]" Centers for Disease Control and Prevention, 2011 [3] Centers for Disease Control and Prevention , 2023

OxyReel