BREATH OF LIFE

Pressure Swing Adsorption Oxygen Concentration for Hospitals in the Developing World

DEVIN ESCH
KATIE HEINDEL
SPENCER PETERSHEIM

Fourteenth Annual School of Science, Engineering, and Health Symposium
April 28, 2017
Macha Mission Hospital
Macha, Zambia
PROBLEM STATEMENT

Macha Hospital has problems with oxygen concentrators failing due to humidity and power outages.

GOAL: Remove humidity from the air before it enters the machine to increase the life of the concentrators.
PROPOSED SOLUTION

**Electrostatic Precipitator**

- Uses high voltage to remove water from the air
DESIGN

Negatively charged wire mesh

High voltage supply

Positively charged aluminum honeycomb
FUTURE STEPS

• Test effectiveness of Electrostatic Precipitator

• Design method of attachment to oxygen concentrator
HIGH VOLTAGE SUPPLY

Converts power from a wall outlet to approximately 11,000V DC.
DESIGN

• Utilized a transformer commonly found in old color televisions and computer monitors.

FLYBACK TRANSFORMER AND DRIVER CIRCUIT

ENCLOSURE FOR SAFETY
1) Spark test

2) Voltage Measurement
   10,760V DC
MOVING FORWARD

• Fixing major safety issues

• Improving ease of use
HOSPITAL-WIDE OXYGEN SYSTEM (HWOS)

How can the entire hospital have oxygen when there is no power?
PROPOSED SOLUTION

1. Compress
2. Expand
3. Drain
4. Concentrate
CURRENT DESIGN
FUTURE STEPS

- **Determine time for temperature drop after compression**
- **Obtain a high-pressure compressor**
- **Safely pressurize an empty air tank**
ACKNOWLEDGEMENTS

Machac Mission Hospital, John Spurrier DeVilbiss
The Collaboratory for Strategic Partnerships and Applied Research
Messiah College Department of Engineering
Advisors: Dr. David Vader, Robert Reed
Additional Breath of Life Team Members: Caleb Sisson, Kristen Frawley, Jordan Sponsler, Michael Smith
QUESTIONS?