Department of Engineering

Messiah College

the Collaboratory for strategic partnerships and applied research

BREATH OF LIFE

Pressure Swing Adsorption Oxygen Concentration for Hospitals in the Developing World

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CLIENT

MACHA MISSION HOSPITAL

MACHA, ZAMBIA

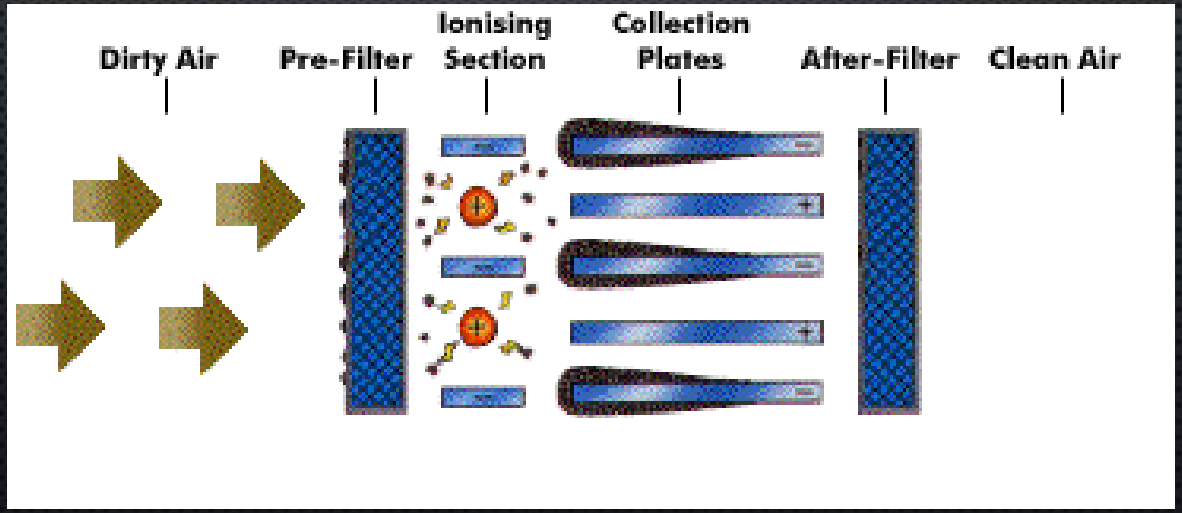
PROBLEM STATEMENT

- 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

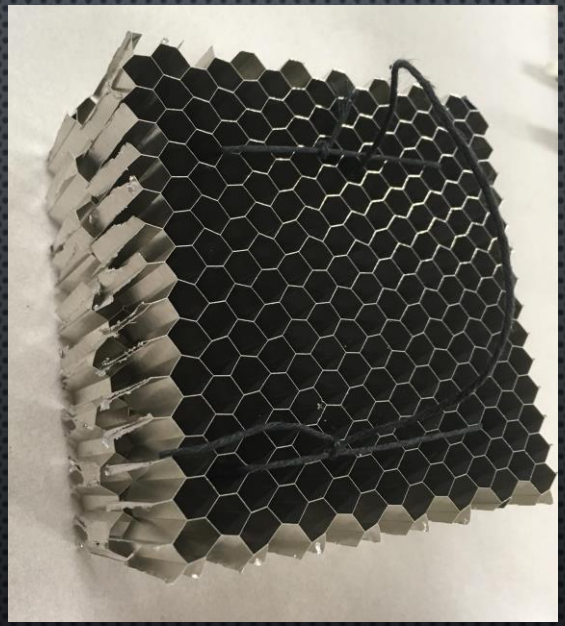
ELECTROSTATIC PRECIPITATOR

- USES HIGH VOLTAGE TO REMOVE WATER FROM THE AIR



DESIGN

Negatively charged wire mesh



High voltage supply

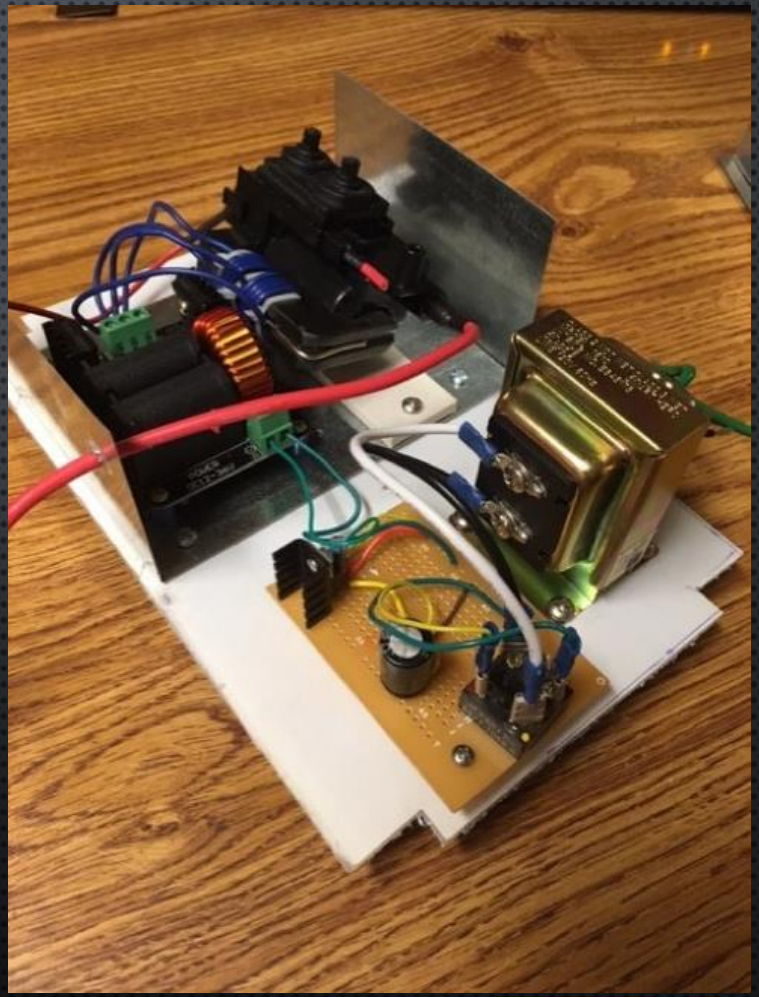
Positively charged aluminum honeycomb

FUTURE STEPS

- Test effectiveness of Electrostatic Precipitator
- Design method of attachment to oxygen concentrator

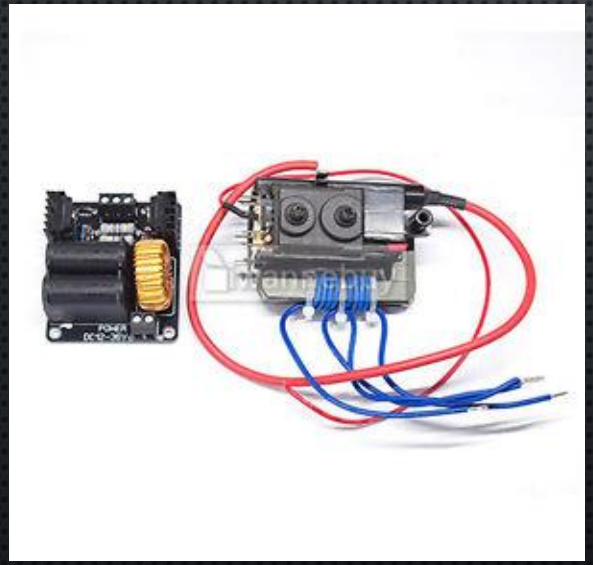
HIGH VOLTAGE SUPPLY

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



DESIGN

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



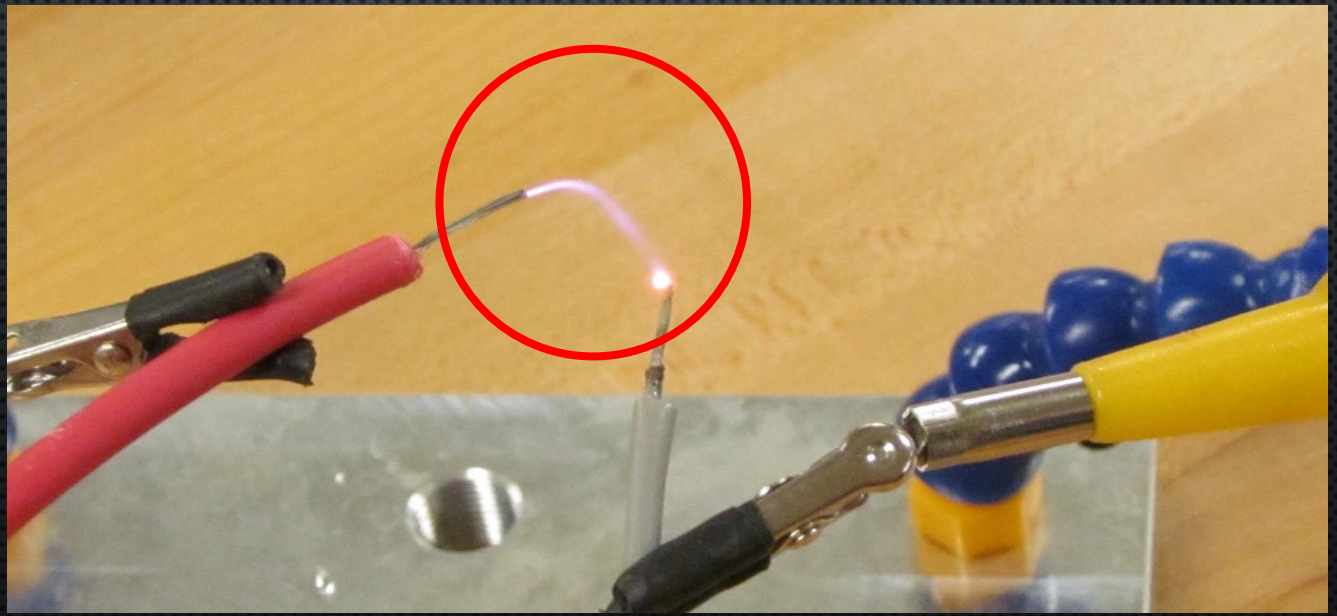
FLYBACK TRANSFORMER AND DRIVER CIRCUIT

ENCLOSURE FOR SAFETY

TESTING

1)SPARK TEST

2) VOLTAGE MEASUREMENT
10,760V DC



MOVING FORWARD

- Fixing major safety issues
- Improving ease of use

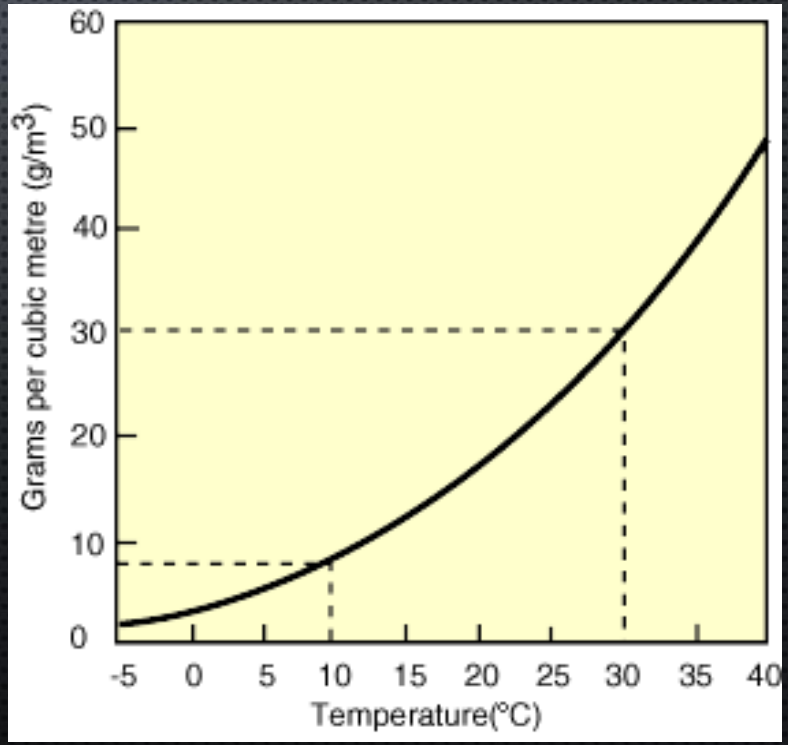
HOSPITAL-WIDE OXYGEN SYSTEM (HWOS)

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

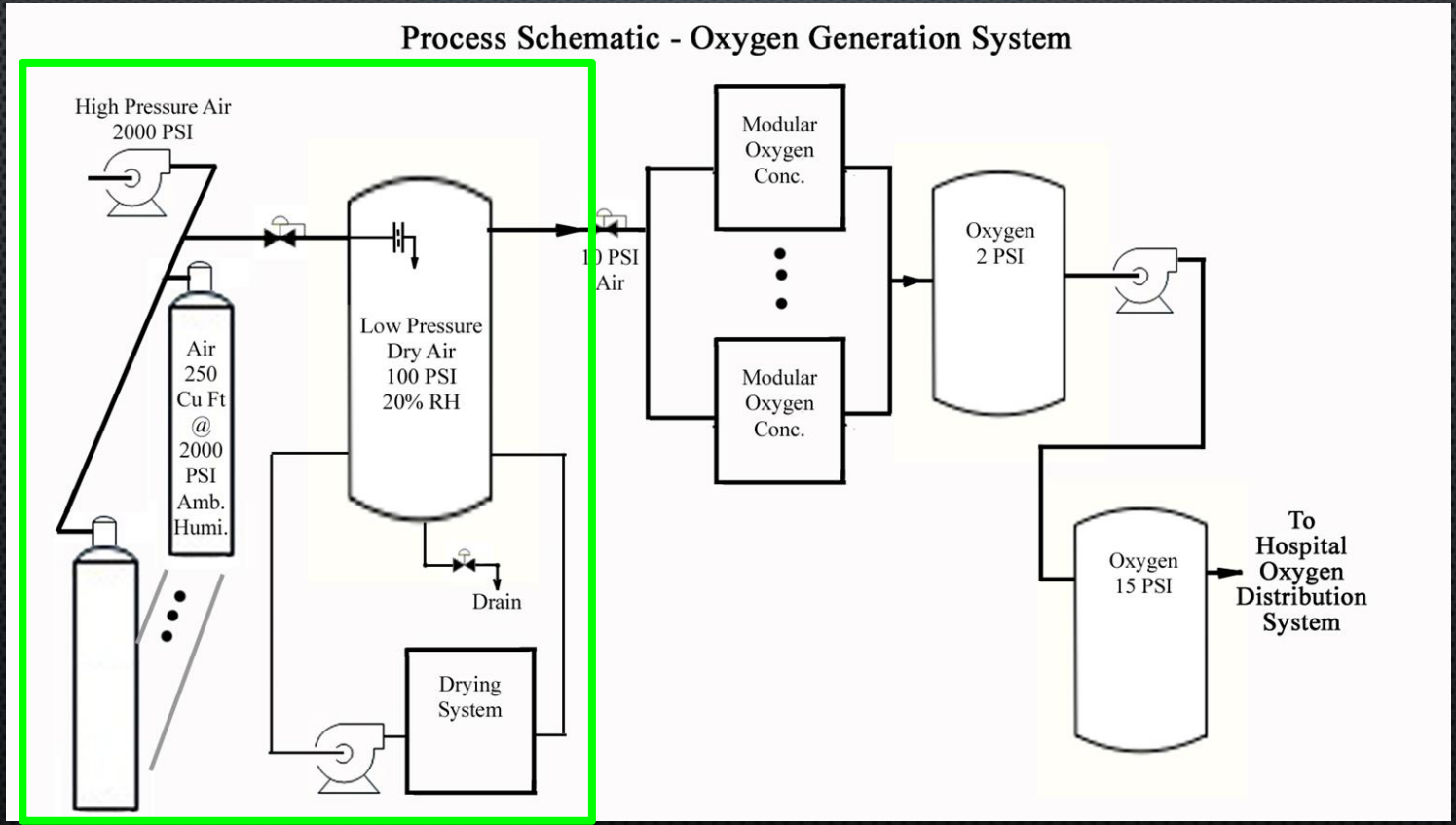
PROPOSED SOLUTION

1. COMPRESS
2. EXPAND
3. DRAIN
4. CONCENTRATE

RELATIVE HUMIDITY



CURRENT DESIGN



FUTURE STEPS

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

Acknowledgements

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The Collaboratory for Strategic Partnerships and Applied Research

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QUESTIONS?