Compact Dehumidifier

MECH 4382 - Spring 2017
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Project Background

- General Dynamics Mission Systems develops satellite communications terminals for use on military vehicles.
- The interior of the terminals must be kept dry, but the lack of space, power, and weight budget makes conventional dehumidification methods difficult to deploy.
- Dry Labs Inc. was tasked with designing and fabricating a compact dehumidifier to be used as proof of concept by General Dynamics.

Objectives

- Determine appropriate dehumidification technology.
- Maintain relative humidity inside test enclosure below 95%.
- Takes up less than 250 cubic inches in volume.
- Powered by less than 100 Watts.
- Weighs less than 14 pounds.

Technology

- Conventional HVAC
  - Too heavy, uses too much power
- Desiccant
  - Requires too much volume
- Ionic Membrane
  - Low performance
- Air Purging
  - Pressurized tanks not ideal for combat
- Peltier Thermoelectric Cooling
  - Small, light, uses little power

Design

Overview

Dehumidifier

Detailed View

Impelling fan

Hot heat sink

Peltier chip

Cold heat sink

Testing

Dehumidifier performance tested inside environmental testing chamber

9 hour test with 1 liter of water

Results

- Maximum recorded humidity: 91.6%
- Average humidity: 88.8%

Acknowledgements

- Technical manager: Dani Fadda, Ph.D., P.E.
- Corporate mentor: Cynthia Humphries, EIT
- GD Technician Lee Pierson

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