Solar Peltier Dew Harvester

Emma Barrett• Sara Zorica • Justin Pickering• Austin Van Rossum

FUNDED BY LAB FUND ENGINEERING STUDENTS

Problem Statement

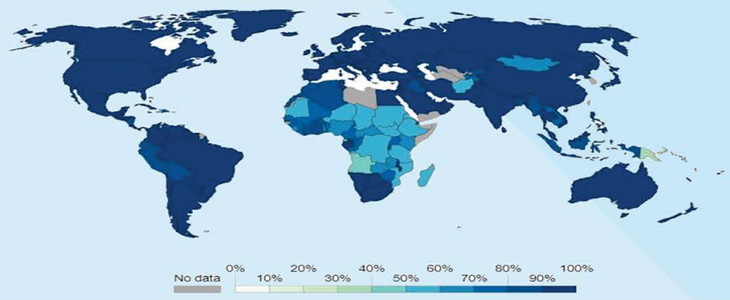
- Access to a clean and reliable water source is not available in many communities around the world
- Worldwide, 1.1 billion people do not have access to clean drinking water
- 5x as much water is available from the humidity in the air as is available from rivers on Earth
- Dew point is the temperature at which the water vapour in air condenses into liquid water at the same rate at which it evaporates, which is the concept utilized to successfully harvest water from the atmosphere

Objective

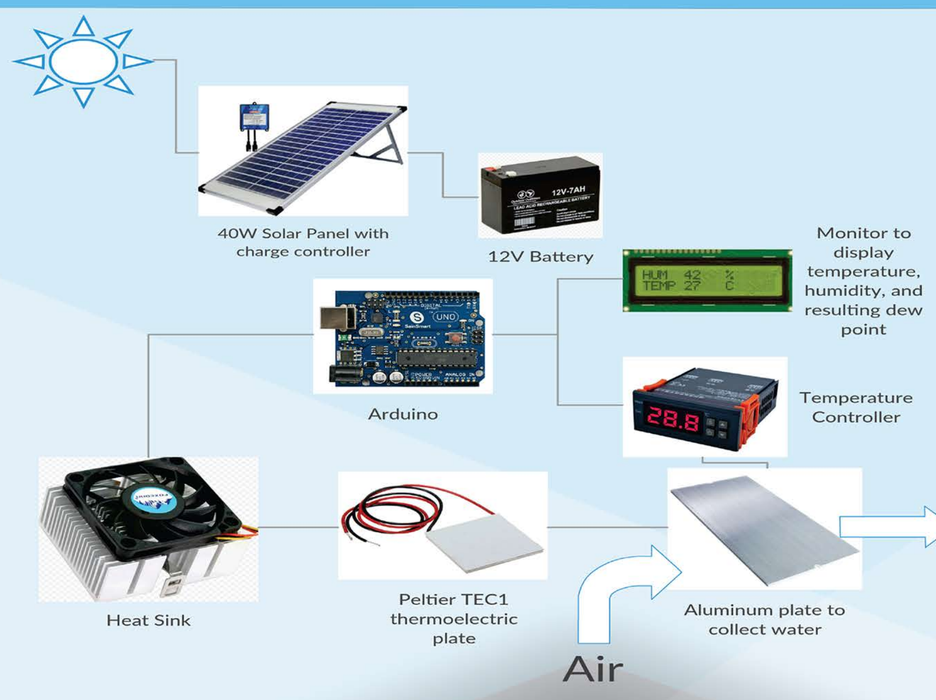
Our mission is to create an alternative solution to collecting water by creating a dew point water harvester. The system aims to optimize the ideal dew point conditions by controlling the required temperature needed with minimal user involvement in order to continuously collect clean drinking water. The project aims to effectively use solar energy to power the system, which includes a thermoelectric Peltier plate to create optimal temperature conditions on a collection plate.

Average Humidity & Dew Point of Countries with Less than 95% Access to Drinking

Number of Countries with less than 95% access to drinking water	Average Humidity (%)	Average Dew Point (°C)	Countries Out of Our Achievable Dew Point Range
90	68.45%	16°C	0

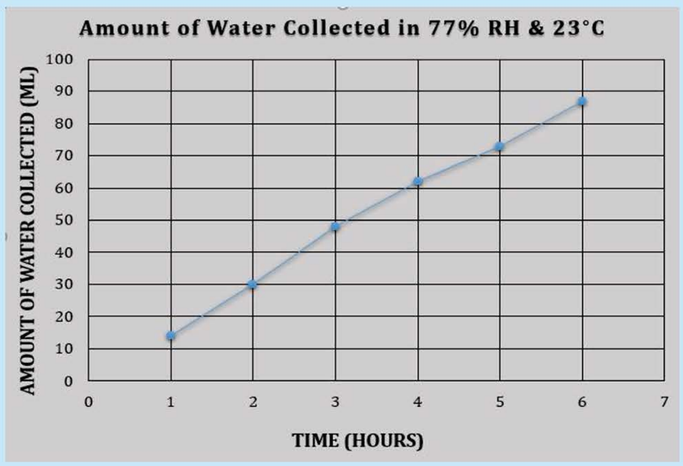


Design Overview



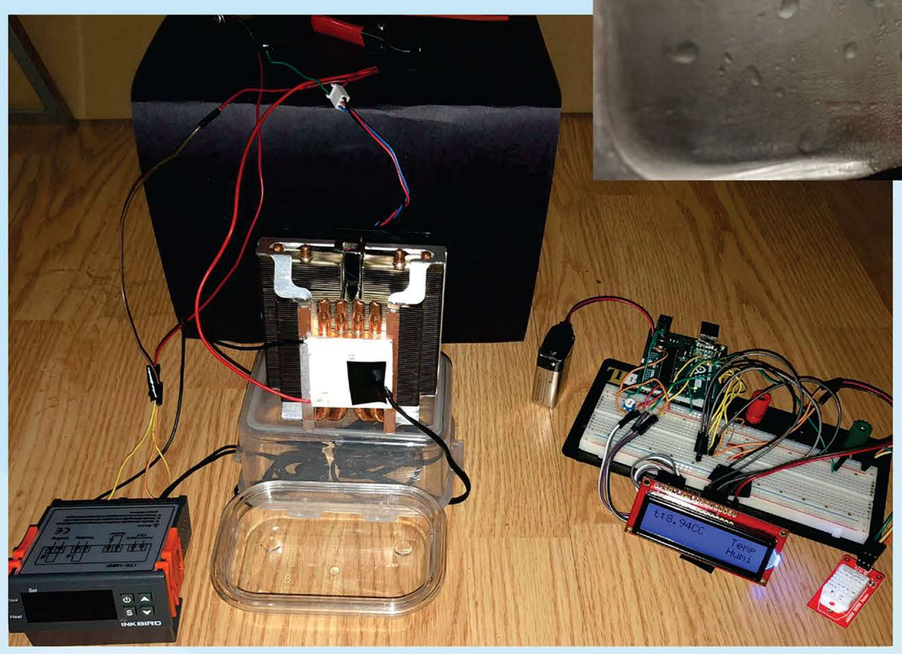
Problem Solution

- A thermoelectric Peltier cooling plate is used to create a surface temperature that matches the required dew point
- Thermoelectric cooling uses the Peltier effect to create a heat flux between two plates where one plate absorbs heat and the other dissipates heat
- The temperature of the aluminum collection plate is controlled by the use of an ITC-1000 temperature controller
- The DHT22 temperature and humidity sensor is used to determine the corresponding dew point temperature via an Arduino Uno microcontroller
- A CPU heat sink and fan is incorporated to reduce heat from the hot side of the Peltier plate



The following results were gathered based on a constant humidity of 77% in a 23 degree setting over 6 hours. The surface area of the plate used was 49.5 cm^2.

Right: Water beginning to form on the aluminum plate



Left: The design set up featuring all of the required components.

Future Recommendations

- An automated connection between the dew point and controller
- Increased water collection surface area & scale
- Higher efficiency battery
- Higher wattage solar panel

UNIVERSITY of GUELPH
ENGINEERING
Special Thanks to Dr. Amin Komeili, PhD, P.Eng
Mechanical
Biomedical