The Design and Creation of a Solar Powered Trail Water System That Uses a Turbidity Sensor

Neeladaran, Tarini (School: El Toro High School)

Thousands of hikers have died on trails because of dehydration. As a junior ranger in 32 National Parks, I took an oath to protect the parks and the people. Because of this, I wanted to create my project around protecting these hikers. My solution is a Trail Water System that pumps and filters water from a stream and a sensor unit that confirms the quality of the water. Market research: Initially, I confirmed my system could save lives by sending a survey to the 60 US National Parks. “tcarbon” Filter: Second, I created a filter that can last without needing to be replaced. I manufactured a carbon/silver (C/Ag) filter and used solar powered pumps to create a backwashing system. Sensor Unit: Third, I created my sensor unit using a turbidity sensor that measures the quality of the water. To create my unit, I self-taught myself how to code using C and manufactured a Printed Circuit Board (PCB) at home. I created my PCB by designing and etching the connections on a bare copper board and soldering the parts to the board. I also created 3D cases for my sensor unit and filter. Product Testing: Out of the 30 trials I tested my Trail Water System at a stream, I recorded my system can pump at the rate of 50 gallons per hour and filter clean water with a turbidity measurement of ~350 NTUs (same quality as bottled water). Cost Analysis: The current cost of my Trail Water System is $72.41.

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