



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

<b>Name(s)</b> <b>Ahmed A. Mohamed</b>	<b>Project Number</b> <b>S1118</b>
<b>Project Title</b> <b>H2U: Water Solutions for the Modern Household</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The average American homeowner uses an average of 360 gallons of water per day. About 40% of that water is devoid of any toxins or impurities (Green). An additional 35% can be easily purified. That amounts to 270 gallons of clean, reusable water that is poured down our drains. The state of California is currently regressing into a drought, yet our water conservation efforts remain sedentary. Without advancements, our supply of water will quickly dwindle. The goal was to develop a device that could identify the filterable/clean water, and divert it into a holding tank for reuse throughout the home.</p> <p><b>Methods/Materials</b> Turbine: Developed using CAD and CFD software. Water System: Developed through the study of hydroponic systems. Used an Arduino, pH sensor, and an electric conductivity sensor. The Arduino was used to process the results of the sensors and control multiple solenoid valves used to control the flow of the water. Filter: A traditional carbon filter was made, and tested in order to discover it's limitations.</p> <p><b>Results</b> Turbine: A standard inline Turgo turbine was developed which was able to produce 10 watts and 11.5 volts. Water System: The sensors had to be placed in separate tanks as the conductivity sensor was affecting the results of the pH sensor. The system is able to accept and divert 2 gal/min. Filter: The filter was able to filter out 99% of all liquids between 6-9 pH and 2-4 ms/cm.</p> <p><b>Conclusions/Discussion</b> The turbine is able to generate 11.5 volts consistently, thus, I had to trickle charge the battery, have two separate batteries, and have one running the system while the other is slowly charged. I estimate that if the systems usages were to remain consistent and the device were to be used at an average of 20 mins per day, then the batteries would have to be switched every two weeks, and would have to undergo a full charge (through a wall socket) at least once a year. Other than the maintenance requirement, the system works as needed. The charcoal filter is able to accept water within 6-9 pH and 2-4 ms/cm. This means that roughly 60-70% of the water that goes down sinks, showers, and washing machines (the drains accounting for 80% of all household water wasted) can be filtered and reused. And if one device is attached to these drains, the average household would save 170 to 200 gallons per day. That is 62,000 gallons per year, about half of their yearly water usage.</p>	
<b>Summary Statement</b> An automated way of filtering and reusing grey water within the home.	
<b>Help Received</b>	