ASME Student Design Competition: H2GO!

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Abstract

Green energy is being used more each day. However, there is a green source of energy that has not yet been fully tapped -rain. The potential energy of 1 inch of rainfall on the average single-story house, if captured at the roof height provides approximately 120 kJ of energy, even more if the rain can be captured in motion. Devices to convert and store this energy could be created and an untapped and readily available energy source utilized.

Device Requirements	Car Requirements
1. The only power to be used is 1 L of Water. No stored energy is allowed.	1. Have a mass of 10-90 gram
2. Device must have removable/drainable water storage container.	2. Be 2mm to 45mm wide
3. The Device must fit within a box measuring on the inside 370 x 165 x 165 mm .	3. Be 65 mm to 100 mm long
4. Each team must provide their own car.	4. Not be used as a projectile

Figure 1. Device and Car design requirements.

The Challenge

Design a scaled, proof of concept prototype device that needs to propel a model car as far as possible by converting the potential energy of one liter of water at one meter height. All water must be contained within the device. The device and car design requirements are given in Fig. 1.

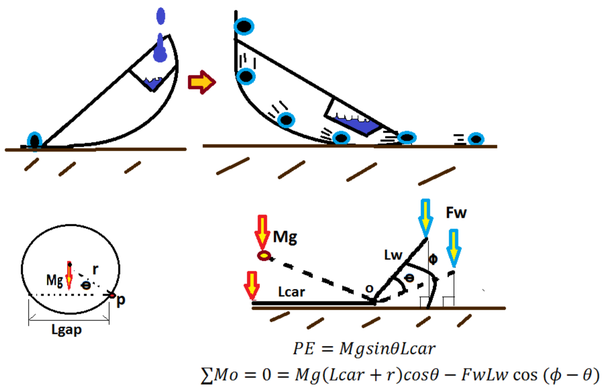

Figure 2. Model force analysis on gravity powered sea-saw device.

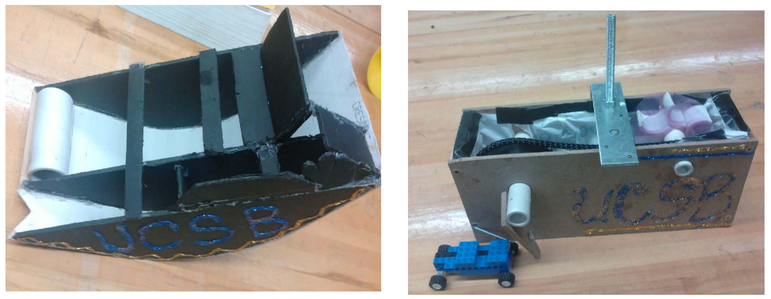

Figure 3. Proof of concept prototyping of both the gravity powered sea-saw and turbine-spring system.

Design Considerations

The two designs considered for the competition were a gravity powered sea-saw and a turbine powered spring system as seen in Figure 3. The gravity device used the force of water gathered to lift the car until it tipped over due to its center of gravity causing a force imbalance. It then converted the potential energy of the car into kinetic energy. The turbine system would use the force of water to pull an arm attached to the spring back until it stored enough force to overcome that of the water, which would then transfer the potential of the arm to the car by hitting it.

Figure 4. Competing with the turbine-spring system and gravity powered sea-saw.

Competition Results

When competing (Fig. 4), the turbine-spring system was not able to develop enough force to overcome friction and inertia in the system and therefore did not function as intended. The gravity powered sea-saw did though and was able to propel the car to about 15 feet, placing it third overall in the student regional conference.

Figure 5. The design competition team at the ASME Student Professional Development Conference at University of Nevada Las Vegas.

ASME UCSB

The American Society of Mechanical Engineers at UCSB's goals are to develop interest in the discipline of Mechanical Engineering, develop professional leaders, and provide opportunities to apply engineering knowledge.

For more information or to get involved in ASME, send an email to: asmeucsb@gmail.com

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