Abstract: Science and Engineering Fair of Houston

1224

Does changing from compressed air to water affect the lifting power of the hydraulic arm?

Liliana Marquez

Houston ISD/BCM Biotech Academy at Rusk - MS

Category:

Engineering Mechanics

This project was designing & constructing a hydraulic crane model to see whether air or water had more lifting power. I found out was that water had more lifting power than air while picking up the objects. This is useful to society because it helps people understand the movements and why it lifts the objects with ease. This could be used by construction companies or engineers as they plan projects.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1225

A Shaky Situation

Brianna Osorio

Alief ISD/Olle MS

Category:

Engineering Mechanics

This project explored how different building structures respond to earthquake forces by testing four structural models: shear wall frame, moment frame, braced frame, and an unreinforced model. Each model was subjected to repeated simulated earthquake rounds to evaluate stability and resistance to collapse. The results revealed clear differences in performance. The shear wall frame proved to be the most effective, remaining stable and never falling throughout all testing trials. In contrast, the braced frame collapsed by trial 2, the moment frame failed by trial 3, and the unreinforced model performed the worst, collapsing by trial 5. These findings highlight the importance of structural reinforcement in earthquake resistant design and demonstrate how shear wall systems significantly improve building safety during seismic events.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[X] yes [ ] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1226

How can tires be safer?

Raghav Gupta

Katy ISD/Beckendorff Junior High school

Category:

Engineering Mechanics

Road travel is a daily activity for most people and carries a significant safety risk. When traveling on the road, the only thing keeping a car connected to the road is the tires, and tire grip is critical for the safety of those travelling. This project investigates how tire design and tread improvement can affect traction and grip. Different tire designs were tested multiple times in a scaled down car to determine the traction by measuring the stopping distance and turning on multiple surfaces. I hypothesized that complex tire patterns and optimised tread depth can lead to a tire having more traction and grip on the ground, therefore making it safer to be driven with. The results showed that complex and more optimised tire patterns and designs helped keep the car on the road and demonstrated how a better tire design can help reduce accidents in real world driving.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1227

Building bridges: Arduino Based Tensile Strength Mapping of Varying Cantilever Bridge Designs

Nidhyana Parghi

Conroe ISD /Collins Intermediate

Category:

Engineering Mechanics

An estimated 1,252 bridge failures have been reported between 1980 and 2012, resulting in an estimated 3.5 trillion dollars loss. Cantilever bridges have failed due to basic design flaws that cause increased stress on a single support bar or tooth, which has been difficult to predict because of bad simulation data. One example is a bridge in Western Nepal that connected the Gagangouda and Lamgadi districts over the Seti River, which collapsed in 2022 leading to 140 deaths. This cantilever truss bridge design is very similar to the models that I have built. In this project, I tested 8 model cantilever bridges with different truss designs in their ability to tolerate different weight loads ranging from 100 to 1000 grams. Each simulation tested the model bridge suspended across two bricks. Using a flex sensor, up to ten different weight loads were tested in the middle of each bridge and the results were captured on an Arduino-based software (CoolTerm). Each model and weight simulation captured more than 150 resistance measurements from the flex sensor. Models 1 - 5 using stick based truss designs unlike models 6 - 8, which were made up of twine-based truss designs. Models 1-5 did not collapse in the 10 weight simulations while Models 6-8 collapsed before the 1,000 gram weight load. Model 3 had the lowest variability in resistance suggesting that it distributed weight better than the rest. This project demonstrated realtime weight load testing may predict bridge failure and prevent bridge-related deaths.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1228

Smart Solar Energy

Philip Bae

Charter/SST - Champions College Prep - MS

Category:

Engineering Mechanics

The purpose of my project is to find the optimal direction for gathering electricity using solar panels. I hypothesize that the solar panel facing south will help generate the most electricity because the south faces towards the equator/ sun. To make this happen I will make a little stand and put solar panels on it. For around 5 hours (11:00 am-3:00 pm) I will take measurements every 30 minutes. As a result, south collected the most energy overall, although the east also collected a significant amount of electricity. I conclude that east & south are both great directions for charging solar panels.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1229

Sub Sea Cleaner

Eli Hale

Clear Creek ISD /Brookside Intermediate School

Category:

Engineering Mechanics

Today's problem is everywhere, but mainly in the ocean. It's pollution. It causes many sea animals to get caught in plastic and other harmful processed materials that don't just kill sea animals but earth in general. That's why this ROV (Subsea Cleaner) was created (matters)! Its purpose is to either go down or up into bodies of water to collect big pieces of trash. Which includes cans, plastic bottles, wrappers, all kinds of stuff that the ROV can fit and lift! Compared to a past project (Seaperch) this was an improvement because this year's ROV was able to lift 300 grams while last year's was only able to lift 226 grams. This ROV contributes a lot to this category since it involves a lot of mechanics such as a ballast system and bigger motors that require a homemade canister. Though, the ROV did not meet the design criteria. The design criteria expected was the ROV being able to move smoother and faster while being near the bottom of the water. This could be improved by using a material for the frame with low friction.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[X] yes [ ] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1230

Rolling With Science: Newton's Ride

Category:

Engineering Mechanics

Vielka Rodriguez, yatziri Alfaro

Aldine ISD/Hambrick MS

This project explores how to make a wooden skateboard that takes up less space by creating a detachable board. We measured a regular skateboard, built our own, and then cut it in half so it could fold using metal ganging brackets. We tested the redesigned skateboard by placing different amounts of weight on it to see how well it could roll without breaking. Our results showed that the foldable skateboard worked: it could support weight, roll correctly, and be taken apart and put back together easily. Although it cannot perform tricks and could be stronger with better materials, the design solves the main problem by making the skateboard easier to carry and store. In the future, improving the materials and making the wheels removable could make the skateboard even more portable and durable.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1231

Thinking Inside the Box

Steven Pham, Dominic Le

Alief ISD/Alief MS

Category:

Engineering Mechanics

The purpose of this experiment is to discover which insulation is best at keeping out heat. The hypothesis was that the fiberglass would be most effective. This was tested this by keeping the cardboard prototypes outside at 12pm, and kept it out until 3pm, where data would be collected via thermometer inside. The spray-on insulator was the most effective, with an average of 29.3°C, Heat Barrier as the median, with an average of 33.3°C, and the worst insulation was the fiberglass, being 31°C. In conclusion, the hypothesis was not supported by the evidence as the fiberglass was the worst insulator, with the best being spray-on insulation.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1232

Renewable Energy in Electro Magnetic Systems

Isaac Selim, SARTHAK SUTAR

Conroe ISD /McCullough Junior High

Category:

Engineering Mechanics

The purpose of this project was to create an electromagnetic generator using renewable energy, and compare data to a fossil fuel generator in the same price range. So overall the engineering goal is to build an electromagnetic generator applying renewable energy to increase the voltage by 20% and decrease the cost by 30% compared to a low costing fossil fuel generator. First, a plastic base was built to hold a wooden dowel. On this wooden dowel there was a metal can lid. On this metal can lid were 6 ceramic ferrite magnets arranged in chunks of 3, on opposite sides of the can, and facing opposite poles. Also the wooden dowel holds a pinwheel which will convert the wind energy into mechanical energy. Then around all of this is a plastic water bottle with 450 rolls of copper wire on it. The voltage was measured by applying wind onto the dowel using a hair dryer, which would create electromagnetic induction. Then from here a multimeter was attached to the 2 ends of the copper wire. The voltage was measured every 30 seconds of running up until 90 seconds. The results showed that the generator was able to generate .4v in 90 seconds , which is significantly lower than the fossil fuel generator which generates 120v. This is because the generators are built using high class materials, while this generator is built using diy materials. But our generator is significantly cheaper because the fossil fuel generator is $144 while the electromagnetic generator is $33.57. This means that the electromagnetic generator is 77% cheaper than the fossil fuel generator. Overall the data shows that this generator cannot produce as much electricity as the fossil fuel generator, but is significantly cheaper, can be used anywhere, and does not need to refuel. In conclusion this generator can create voltage anywhere, and in theory when given high class materials, can produce the energy to power a small radio.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1233

Automatic Plant Watering System

Sakshyam Shrestha

Clear Creek ISD /Westbrook Intermediate School

Category:

Engineering Mechanics

I will be creating a system that will checks the moisture of the soil and depending on the plant and other circumtances it will water the pot using a pump.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1234

Hand-Gesture Recognition Glove

Category:

Engineering Mechanics

Derek Chan, Keinan Sherrod

Stafford SMSD/Stafford STEM Magnet Academy

Our project aims to create a wearable device that translates hand gestures into text to improve communication. The main problem we are trying to solve is the inability of communication for individuals with hearing or speech issues. Most solutions to this problem require expensive cell phones or complex setups. This project will provide a simple solution in a budget way. We will attach flex sensors to an arduino nano and a lcd screen, to detect finger bends and hand movements in real time using low-cost sensors. It can help with communicating during an emergency and much more. We tested our prototype and our glove translated all the messages correctly. In conclusion our project will be able to help people with hearing or speech issues communicate.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1235

Water at Work: Stability Experiment

Category:

Engineering Mechanics

Elizabeth Cepero

Conroe ISD /Knox Junior High

The purpose of this project is to test how much of an impact Tuned Liquid Dampers make to the stability of skyscrapers during earthquakes. The hypothesis states that if a tuned mass damper is going to effectively counter the vibrations of a building, then it must have a specific "tuned" volume of water because only then will its frequency of oscillation be able to absorb the vibrations of the building. In this experiment, two identical building models were placed on a mechanism that simulates an earthquake. One tower had a water cup and the other had no cup to serve as the control for the experiment. Three trials were done with each volume of water (35 mL, 70 mL, and 140 mL) to determine which volume of water had the best dampening effect by counting the number of oscillations they made in 2.5 seconds. The results of the experiment were that 70 mL of water had the best effect at stabilizing the building and reducing the amount of oscillations. 35 mL of water was too little volume to make as much of an effect on the building and 140 mL of water increased the buildings oscillations. 70 mL of water reduced the oscillations by about 4 every 2.5 seconds. This information will be exceedingly useful in fields such as civil engineering, building skyscrapers in earthquake prone areas, and stabilizing constructed buildings for human safety.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1236

Blown Away

Mallory Bartholomew

Conroe ISD /Knox Junior High

Category:

Engineering Mechanics

The purpose of this experiment is to determine which roof shape withstands high winds the best. The hypothesis states that if a roof does not have overhangs then it will be able to withstand high winds because air will not be able to get under it and lift it up. As wind flows over a roof it creates a low pressure on the roof, while more wind is pushing against the lower surface of a roof, creating high pressure. When there is a large surface area for the pressure difference to act it leads to a greater potential for uplift. In this experiment the researcher tested how different overhangs affect wind resistance. Each model house was built with a different roof: pyramid, flat, gable, and butterfly. The roofs were then attached by a hinge on the outside. Each house was placed at a starting spot of 11 feet away from the wind source, and was pushed up by half a foot until the roof blew off. Then the data was recorded and put into a graph In conclusion, house 1 (pyramid roof) withstood the wind the longest. It made it to 6.5 feet with 15 mph wind before the roof blew off, with the other houses averaging around 9.5 feet with 9 mph winds. The results of this experiment support the hypothesis that houses with no overhang better resisted uplift than the houses with. Although this experiment only tested the shape, other factors like weight, debris, and roof material may affect the roof's ability to beat uplift in the real world. In the future this experiment can be used when homeowners are looking for houses in hurricane prone areas, and can help architects when they are designing more wind resistant homes.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1237

Category:

Engineering Mechanics

PediaFlex: A Bioinspired, Expandable Pediatric Prosthetic employing a Pneumatic system to enhance K levels and Long-Term use for Transfemoral Leg Amputation Patients

Sai Sahasra Maram

Fort Bend ISD /Quail Valley Middle School

Lower limb-loss affects 5 million children annually, with over 60% being transfemoral amputees. However, 90% of these amputees cannot afford to replace these pediatric prosthetics every 6-12 months, which increases chances of spinal deformities, osteoarthritis, and other long-term disabilities. Pediaflex mitigates this problem by accommodating growth through each pediatric size, thus reducing the need for frequent replacements. Even through this long-term use, Pediaflex's bioinspired and pneumatic design maintains K levels, torque, flexion, and durability. The bioinspired design of the knee is based off bamboo structures, while the pneumatic system simulates functions of the hamstrings to support torque in the socket. The prosthetic was prototyped using online simulations from Autodesk Fusion's movement and durability testing before being created in Nitinol, Polyurethane, Silicone, and Titanium. Performance was evaluated using factors such as area, force from the stump, typical subischial positions, kinematics, and expansion to determine accuracy to the Gait Cycle. With the pneumatic system, torque was greater than 10 Nm in the socket. Pediaflex achieves a torque of greater than 20 Nm with the knee and 30 Nm in the ankle. Additionally, the prosthetic was able to achieve successful degrees of flexion, with 60 degrees for the ankle, 17 degrees for dorsiflexion, 43 degrees of plantar flexion, and successful inversion and eversion of 32 and 11 degrees. Averaged with the kinematics, Pediaflex is 88% accurate to the Gait Cycle, which is 28% greater than current prosthetics. Pediaflex offers a viable, affordable, and expandable design which aids child transfemoral amputees in rehabilitation and lifestyle.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[X] yes [ ] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1238

Mars Exploration

Mason Ard

Clear Creek ISD /Brookside Intermediate School

Category:

Engineering Mechanics

ABSTRACT Mars rovers are one of the few ways humans can study Mars, so they must be as efficient as possible. Mars rovers collect a large amount of data that can be used to prepare humans to travel to Mars. This project focuses on identifying the specific aspects of rovers that are most important, so that those parts can receive the most focus when constructing real Mars rovers. When this project was initiated, the hypothesis was that if each rover model was tested, the tank rover model would perform the best. Four rover models were tested through various zones, and using a score sheet, they were assigned scores. The rover that scored the highest was the base model rover, scoring 85 out of 100. This rover had no modifications at all. The tank and scout model rovers tied at a score of 80/100. The tank rover is heavy due to its extra weight and shell, while the scout rover is light with parts removed. Last was the solar power rover, scoring 65/100. The solar rover is the base rover with the solar panel attached. Overall, this project proves that a rover with strong wheels, steady speed and weight is what is needed to be successful on Mars.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1239

The Physics Behind The Sound

Siya Bansal, laura merchan

Conroe ISD /York Junior High

Category:

Engineering Mechanics

Have you ever wondered about the physics behind the sound with string instruments? This project explains the beauty on how it works so it can be better appreciated. If the tightness of the string is increased, then the sound pitch will be higher. The materials required are a shoes box, large rubber band, tuner, and a 3d printed bridge. This can be tested by placing the rubber band over the box, then placing the 3d printed bridge under the rubber band. The hypothesis can be tested by bringing the bridge farther or closer to you, changing the tightness and pitch of the rubber band which is acting as the string. This also helps demonstrate how having a larger or smaller resonating chamber amplifies the sound of the string being plucked. Using this model, there is a drawing showing the parts of an orchestra instrument. There is also a table showing the note played when how many centimeters to the edge the bridge is.There is a picture of a cello to show what it looks like in real life. A video is played of a cellist and a violaist doing a duet together. This is figured out by using a tuner and plucking the string to figure out where the note is. In conclusion, the sound of an note being played is affected by the tuning and the size of the resonating chamber.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1240

Impoundment Facility Designing

Category:

Engineering Mechanics

Tabitha Godwin

Clear Creek ISD /Seabrook Intermediate School

We can get electricity from several different sources, the one that hurts the environment the least is renewable energy. Hydro power can be created by controlling the release of water from Impoundment facilities, using the power of water to turn turbines which generate electricity. The turbines can supply power to storage batteries, or people's homes via power lines. This study was preformed to see what type of turbine is the most efficient, so this study was devised to test this thesis, if different impoundment designs are used then, Impoundment model1/ open turbine will generate the most energy. Four models were made one open turbine, and three pump turbines. The outcome of this study was, Model1 proposed the most power and had the least fluctuation. The power increased as the head pressure increased. Models 2-4 Utilized a novel design. The data shows that this design is very unreliable and has a lot of fluctuation. In turn, it caused Models 2-4 to have much less power. As the nozzle diameter was reduced the power reduced. As the hasher went down the fluctuation went up. The novel designs are quite unreliable but were reliable only at high head pressure.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1241

Category:

Engineering Mechanics

Experimental Analysis of Design and Environmental Factors Affecting Triboelectric Nanogenerator Output

Alivia Hus

Conroe ISD /McCullough Junior High

Triboelectric nanogenerators (TENGs) convert mechanical motion into electrical energy. However, their output can change under different environmental conditions. The main purpose of this project was to determine how temperature, and humidity affect the voltage output, consistency, and predictability of different TENG designs. Six TENG designs with different surface areas were created using Teflon or scotch tape as negative materials and aluminum as the positive material. Each design was tested across five trials at room temperature (70°F), 50°F, 45°F, 10°F, 100°F, and high humidity. Voltage output was then measured using a multimeter. The results showed that the designs with greater surface area produced higher and more consistent voltage outputs than flatter designs. Lower temperatures and higher humidity generally reduced voltage output. Several designs created a predictable decrease in voltage as temperature decreased, while square-based designs showed less consistent behavior, likely due to uneven surface contact. These findings support the conclusion that increased surface interaction improves both voltage output and reliability. The results also prove that different TENG designs are better suited for different environments, such as predictable designs for cold conditions and high-output designs for applications requiring greater energy generation.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[ ] yes [X] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no