Water Wheel

Course/Grade Level: 9-12	Experiment Duration: 30 minutes to build, 10 minutes to experiment

Website Link to Experiment:
Water Wheels | Rowan Research | Rowan University

Expectations:

1. Students are expected to follow the instructions carefully when building the water wheel model.
2. Students are expected to work safely when conducting the experiment, including being mindful of water and electrical hazards.
3. Students are expected to make careful observations of the water wheel's performance and record their findings accurately.
4. Students are expected to analyze the data they collect and draw conclusions about how the water flow affects the wheel's performance.
5. Students are expected to demonstrate an understanding of the principles of potential energy, kinetic energy, and mechanical energy, as they relate to the water wheel.
6. Students are expected to be able to explain the concept of renewable energy and its importance in our modern world.
7. Students are expected to engage in critical thinking and problem-solving as they consider how different variables affect the performance of the water wheel.
8. Students are expected to collaborate effectively with their peers when conducting the experiment and analyzing the data.
9. Students are expected to ask questions and seek out additional resources as needed to deepen their understanding of the concepts being explored.
10. Students are expected to demonstrate curiosity, creativity, and a willingness to learn throughout the experiment.

Sample Data/Tables if Needed:

Context for Learning

Objective:
To demonstrate how the kinetic energy of water can be converted into electrical energy using a water wheel model, while also helping students develop an understanding of renewable energy and engage in hands-on learning and scientific inquiry.

How this experiment relates to wastewater/water treatment:
Hydroelectric power can be generated from the flow of water in water treatment plants or in wastewater treatment facilities, providing a source of renewable energy to power the treatment processes. Additionally, water wheels and other types of turbines can be used in hydropower systems to generate electricity from water flowing through dams or other structures. Understanding the principles of energy conversion and renewable energy is important for developing sustainable and efficient water and wastewater treatment processes.

Instructional Delivery

Materials:

1. Water wheel kit
2. Water source with a steady flow (such as a sink faucet or hose)
3. Measuring cup or graduated cylinder (to measure the flow rate of water)
4. Stopwatch or timer (to measure the duration of the experiment)
5. Notebook or recording sheet (to record observations and data)

Procedures:

1. Assemble the water wheel kit according to the instructions provided.
2. Connect the red LED light as instructed.
3. Position the water wheel under the water source so that the water flow makes the wheel spin.
4. Turn on the water flow and observe the wheel spinning and the LED light turning on.
5. Measure the flow rate of the water using the measuring cup or graduated cylinder and record it in the notebook or recording sheet.
6. Measure the duration of the experiment using the stopwatch or timer and record it in the notebook or recording sheet.
7. Make observations about the performance of the water wheel, such as the speed and direction of the wheel, and record them in the notebook or recording sheet.
8. Analyze the data collected, including the flow rate, duration, and observations, and draw conclusions about how the water flow affects the performance of the water wheel.
9. Reflect on the experiment and discuss what you learned about the principles of potential energy, kinetic energy, and mechanical energy, as well as the concept of renewable energy.

Assessment/Evaluation

Questions:

1. How did the water wheel in this experiment demonstrate the principles of kinetic energy and mechanical energy?
2. What factors affected the performance of the water wheel, and how did we measure and manipulate these variables?
3. How could we use the results of this experiment to design a more efficient water wheel or other renewable energy technology?
4. What are some ways that we could apply the principles and methods used in this experiment to real-world challenges like water treatment and power generation?
5. What are some potential benefits and drawbacks of using renewable energy sources like water power, and how could we weigh these factors in making decisions about energy use and policy?

Notes: