Twin Wire Resistant Wave Gauge

Joanne Lau

Introduction and Scope

The objective of this project is to design and build four twin-wire resistance wave gauges to measure the change in height of water in a mini-wave flume.

A resistance wave gauge has two parallel wires aligned perpendicular to the direction of wave travel. Conductance between the two wires is related to the water level across the probe pair. As the water level increases, the overall resistance decreases. Based on Ohm's Law, this information can be used to determine the change in height of the water.

Design

Materials needed:
3/8" Acrylic,
1/4"all-thread, wire,
two eyehooks,
L-bracket,
nuts and washers.

Cut two pieces of acrylic 1½" x 3", drill one hole all the way through for the all-thread and tap each hole. For the bottom piece, drill two smaller holes (8"), only halfway through acrylic. Saw two slits from the end to the small holes. The wire will slide through the slit and the crimp will rest in the hole. For the top piece, drill the two smaller
holes all the way through for the eye hooks.

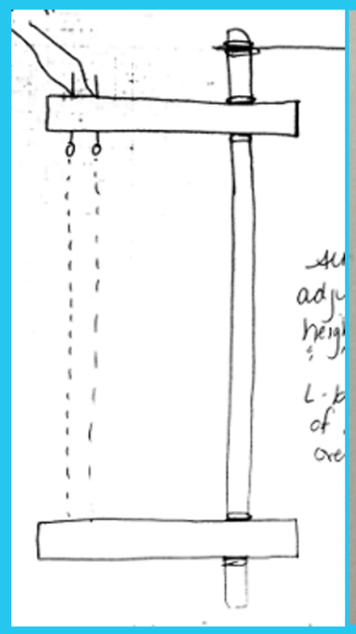
Cut the all-thread to proper height for tank. Thread the two pieces of acrylic on the all-thread and adjust for desired height. Crimp the wires with a loop at one end. Run two parallel wires from the eyehooks down to the bottom plate. Place L-bracket on top portion of all-thread to secure to tank.

Connect to a power source to run a constant voltage. Attach an ammeter to measure the electrical current. Place the wave gauge in the tank and calibrate by measuring the current at different water levels. As the level of water increases, the resistance will decrease and the current will increase.

Ohm's Law
$\Delta V = IR$

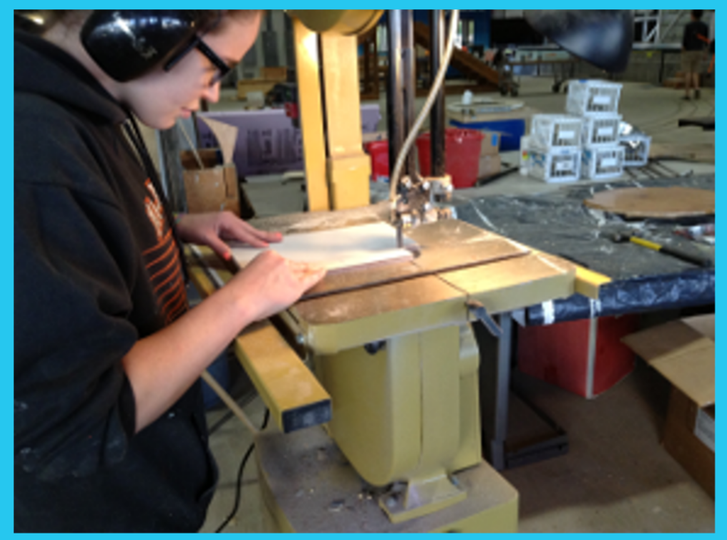
The current through a conductor between two points is directly proportional to the potential difference across the two points.

ΔV: potential difference measured across conductor in volts
I: current through the conductor in amperes
R: resistance of the conductor in ohms



Application

Students can build a wave simulation tank and create a slope and beach with sand. Have them put Lego houses on the beach and observe the destruction and erosion caused by waves of varying heights. From there they can study how to prevent coastal beach erosion, or how to deal with the after effects.



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