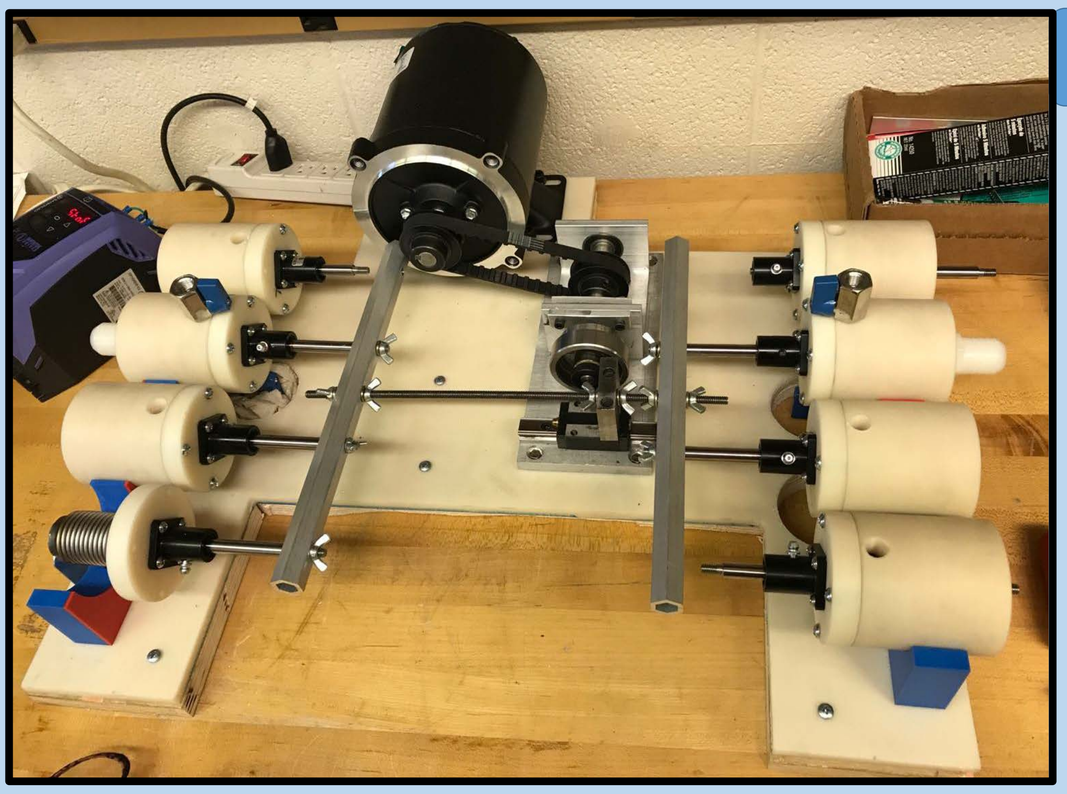
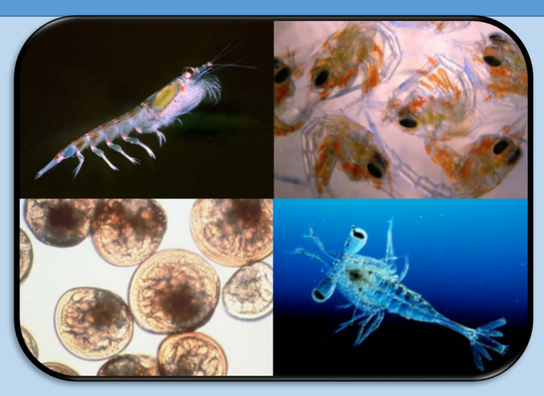
Turbulence Tank 2017

2013 Turbulence Tank

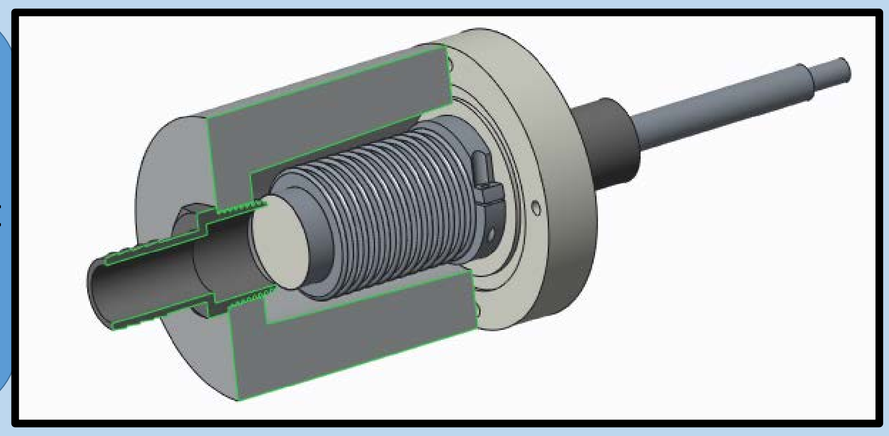


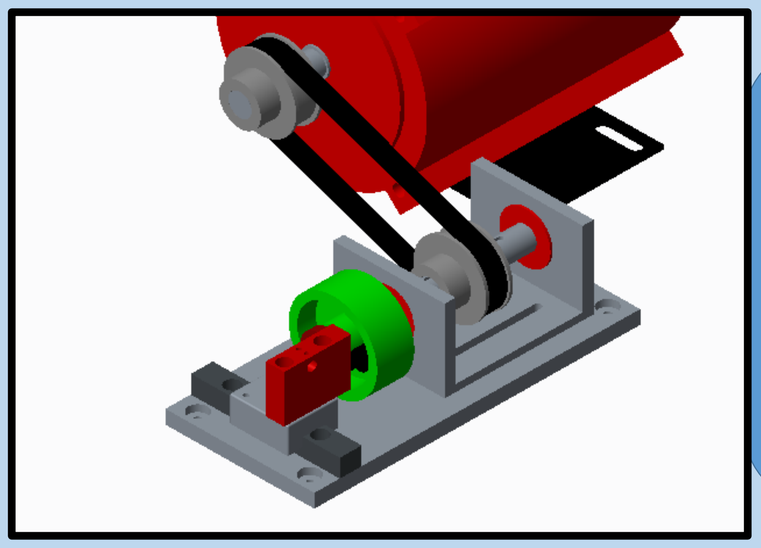
2017 Turbulence Tank

Dr. Anderson uses the tank to study how small, aquatic organisms respond to turbulence. The goal is to simulate ocean turbulence patterns.



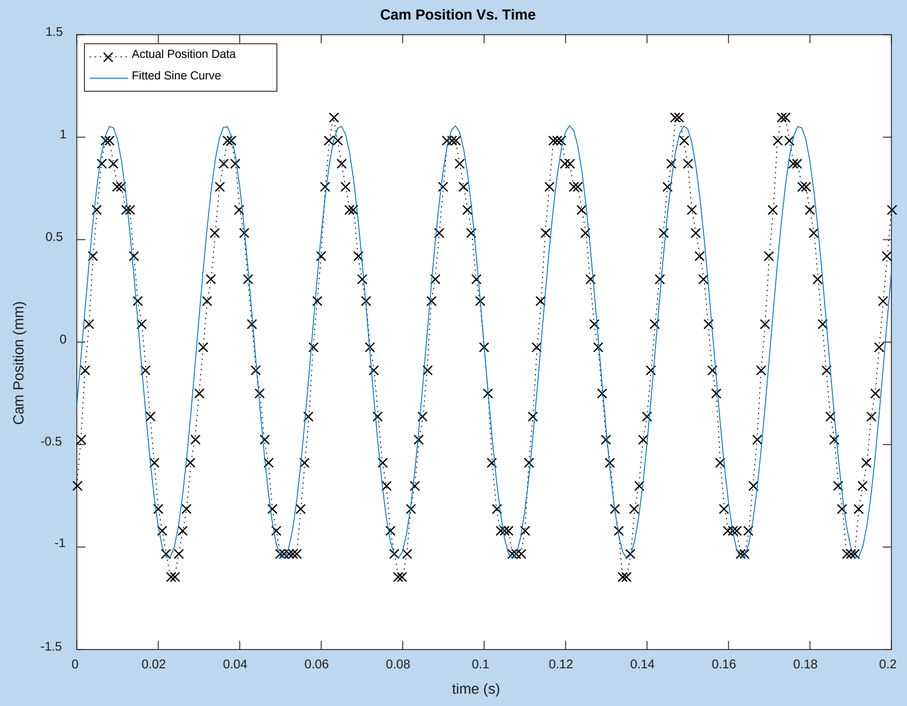
The project required a complete redesign of the actuation system. The previous design used speaker diaphragms with unpredictable movement. The new design utilizes bellows – a metal piece with corrugations that compress as pressure is applied to the end. A bellows gives us precise volume displacement of the water. The bellows are guided by a precision shaft supported by a high speed linear bearing. Each bellows is housed in an ABS canister filled with water, and it pushes that water through tubes that run into the tank.





The new actuation system called for a complete redesign of the driving system. The previous design used an amplifier to input different frequencies, which was no longer applicable without speakers. Our design implements an AC rotary motor and a disk cam to convert the rotary motion to linear motion. The graph and its caption below better explains how the disk cam works. The cam follower is threaded to a carriage that moves linearly on a rail. The hardware and great amount of water being used contribute to large side loads, so a belt system is implemented to reduce the load on the follower. A rod is used to connect the carriage to the piece moving the bellows.

The solid line on the graph shows the path of a perfectly circular cam. Note that this path reflects simple harmonic motion. The X's on the graph show the path of our slightly non-circular cam. As the cam follower moves along the inside of the cam, it displaces +0.2mm driving four bellows, then -0.2mm driving the other four bellows, and continues this pattern. This ensures that that bellows connected to opposite corners of the tank create turbulence 180 degrees out of phase.



Project Advisors:
Dr. Anderson and Dr. Ulrich

Team Members: From left,
Micayla Wright, Timothy Wolfe,
Molly Gallant, Daniel Moll, Danielle Comly,
Mitchell Newburg, Madeline Mitchell

Special Thanks to:
Jim Paich, Kara Henley, Stephanie Adams, and the Engineering Department