On the Cutting Edge: Professional Development for Geoscience Faculty
Teaching Sedimentary Geology in the 21st Century

From Spilled Milk to Making Waves: Teaching Students Using a Flume & Wave Tank

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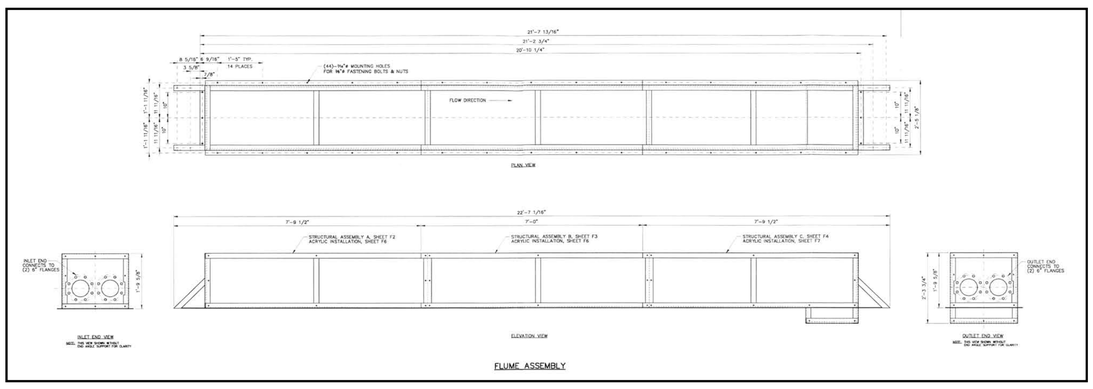
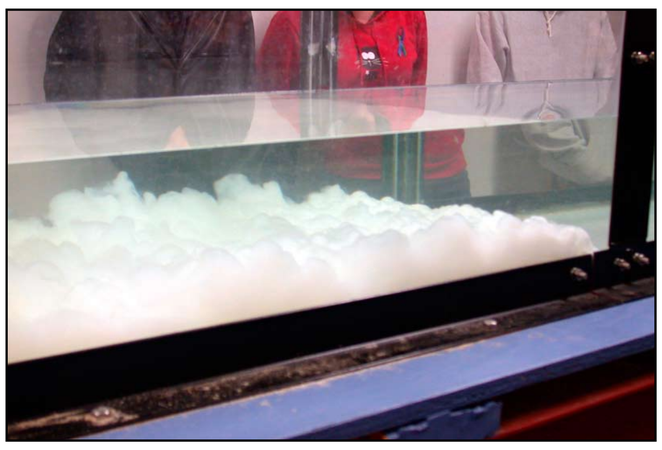
Collaborations with Technology Faculty and Students:

Three collaborative projects brought together nine students and three faculty from the Earth Sciences and Technology Departments. The students were enrolled in ENT422, Machine Design II, a design course in the Buffalo State Mechanical Engineering Technology program and the projects were a course requirement. In the first project, a 16 foot-long wave tank was built. Several years later, the wave tank was extended to twenty-four feet (second project). The third project involved rebuilding a 20 foot-long recirculating flume. The flume that was being replaced was over ten years old and had developed numerous leaks. In the design phase of all three projects, the students evaluated construction materials, construction costs, maintenance, and performed a stress analyses for each design option considered. Today, the wave tank and flume are used to support a variety of demonstrations in courses including GES 300, Sedimentology, GES 315, Marine Environments, and GES 224, Geological Hazards. One of the students' favorite demonstrations involves pouring gallons of milk down the flume to model turbidity currents (see figures below). These two successful collaborations resulted in the design and construction of demonstration equipment for geoscience courses that would otherwise have been financially prohibitive. The students were especially excited to think that the wave tank and flume they built will be used for years to come.

Details of Recirculating Flume:

The original flume was built in 1987 by two undergraduates. Water recirculated through the 20' long flume and velocities were controlled by two butterfly valves connected to PVC pipes and the 7.5 hp pump. Over the years, leaks developed between the joined sections of Plexiglas, but other than the leaks, the operation of the flume was trouble-free. Rather than start again, it made more sense to rebuild the flume. This opportunity also allowed us to make some minor design changes as well. Largely based on the success of the collaborative effort that resulted in the wave tank, the rebuilding of the flume was undertaken in 2000 by students enrolled in the capstone engineering course.The students removed the Plexiglas and most of the old piping. The support platform was then modified to accommodate the slightly modified new tank, frame, and piping (see figure on right). A new valve mechanism was also installed to facilitate draining and cleaning of the flume.





Details of the Wave Tank:

The tank is 24' long, 3'10" high, and 4' wide (see figures below). The tank walls are 1" Plexiglas and are supported within a welded and powder coated steel frame. The frame is supported on 1" plywood resting on a stand. Adjustable feet on the stand allow the frame and tank to be leveled on the floor. The Plexiglas is bolted into place with stainless steel retaining rings. The retaining ring is sealed to the Plexiglas with 1/8" rubber gasket. A rubber 'O'-ring was used to seal the steel frame. One of the benefits of this unusual and unique design is that the wave tank can be repaired and/or lengthened without breaking a permanent plastic bond because each wall of the tank can be removed by unbolting the section. The materials for the wave tank were less than $3000. The Wave Generator is a variable speed electric motor connected to a slider crank mechanism oscillates a paddle. The paddle is hinged to the bottom of the wave tank and the top is attached to a rod that connects to a flywheel. The flywheel is attached to the variable speed motor (see figure below).