Ready to Compete?

MUDDY WATERS

National – There is no advancement to a Society-wide national competition for this competition.

Overview

Civil engineering is a profession which encompasses a great many sub disciplines, including water resources. A population is dependent on its water resources for drinking, bathing, irrigation, agriculture, etc. Being that water is often acquired from uncontrolled, unclean sources, it is necessary to remove impurities to ensure the water is safe to use.

Objective

Each team will pre-construct a homemade water filter system inside of a two-liter bottle. Items that function solely to treat or purify water will not be allowed in the competition. This includes, but is not limited to: reverse osmosis systems, water filters, and water purifiers. In addition, charcoal filters, such as those found in coffeemakers are not allowed in the competition. Each filter will then be tested with a "city sewage" mixture:

- 1:4 soil to liquid mix
- Soil will be comprised of :
  - 80-90% passing No. 4 sieve
  - 20-30% passing No. 200 sieve
  - Up to 15% organics
- Part of liquid will also be vegetable oil

Eligibility

Only one (1) team per school may compete in the Muddy Waters Competition. There shall be no more than three (3) members allowed on each team. Both undergraduate and graduate students are allowed to participate, however, only 1 graduate student is allowed per team.

Rules and Restrictions

- Each team shall construct their filter system using a single two-liter bottle as the containing structure. No valves or other devices may be used to control water flow, or the team member in the treatment area may manipulate the equipment to pass water through the system.
- Each team shall have a system inlet and outlet.
  - Inlet: There is no limit to how far down from the top it can be cut. Funnels will not be allowed.
  - Outlet: Each team shall drill 5 holes in the bottle as a system outlet. The diameter of the outlet holes must be ¼" ± 0" in diameter.
- Filter systems may have an unlimited number of components. However, two of the layers must consist of granular material and a strainer. Additionally, the total cost of the filter system must remain below $200.

- The singular piece of filter must have a diameter no greater than 6.5” and have an apparent opening size of No. 8 or smaller. There is no limit to the thickness of the filter.

- 250 grams of each granular material in clearly labeled, transparent container must be provided. A sample of the strainer of a size approximately 6” x 6”, or of a diameter approximately 6.5”, must also be provided. Labels must be attached to both samples with the University Name. If samples are not provided, the team will be disqualified.

- Each team will produce a short report (limited to 5 pages, including the title) on their filter. This report should include:
  - Title page with the university and team member names
  - A diagram of the filter with all layers coherently labeled
  - A list of all materials used
  - A sieve analysis gradation chart or table of granular material used in the filter
  - Description of design process
  - Cost breakdown of the filter system
  - Appendix with aa material data sheet for every material used and purchasing receipts, including the filter mesh, if available. If a data sheet is not available, include the universal product code instead. The appendix does not count towards the total number of pages.

- Each team should be prepared to give a short (up to 5-minute presentation) to the judges on the engineering design behind their filter systems.

Testing Procedure

- Each filter will be rinsed thoroughly with distilled water to ensure each filter has the same level of saturation (approximately 100% saturated).

- Each team will receive 0.5 liters of the pre-made soil-water mixture (the influent sample)

- The sample will then be poured by one member of the team into the system inlet and through their filter. Upon pouring this sample in, the supervising judge will start a stopwatch. The sample may only pass through the filter once during testing.

- The stopwatch will be stopped when 0.4 liters of effluent sample have successfully passed through the filter, which is determined by having the water draining into a beaker with 0.4 liters marked. If 0.4 liters of effluent sample is not collected within 15 minutes, the team will be deducted a percentage of the 40 points based on the sample collected. For example, if only 0.2 liters (or half of the required sample) of effluent sample was collected in the 15-minute time frame of testing, then the team will be deducted 50% of 40 points, or 20 points.

- When either 0.4 Liters of the effluent sample is collected and the timer has stopped or the 15-minute testing timeframe is completed, the collection beaker will be taken to be tested by a supervising judge.

Scoring and Judging

Points will be determined from the following list of items. The maximum score of points a team may receive is 100 points. The final score will be based on the sum of a team's rankings in these three categories, with the lowest cumulative score receiving first place.

Amount of time to produce 0.4 L of the effluent sample *	40 Points
Turbidity	40 Points
Technical Report and Presentation	20 Points
Total	**100 Points**

*** If 0.4 liters of effluent sample is not collected within 15 minutes, the team will be deducted a percentage of the 40 points based on the sample collected. For example, if only 0.2 liters (or half of the required sample) of the effluent sample was collected in the 15-minute time frame of testing, then the team will be deducted 50% of 40 points, or 20 points.**

Teams will be disqualified from ranking for soda bottle filters that violate the rules of construction, have materials that are not visible through the soda bottle walls, or 'leak' water or granular media during competitive filtration testing.

Important Dates

- Release of Student Symposium Competition Rules and Regulations on November 1, 2024.
- Technical Reports Due by 11:59 PM EST February 7, 2025 through this link: Muddy Waters Submission
- 2025 ASCE Southeast Student Symposium March 6-8, 2025 in Athens, Ga.
- Competition time and location will be released closer to event.

Questions

Requests for information (RFI) must be sent to asce@uga.edu with the subject line "Muddy Waters RFI"