

**2012 Great Lakes Conference
Official Rules- Environmental
Saturday, April 21, 2012
Bradley University**



2012 Environmental Competition

(Wastewater Treatment)

1. The objective of this competition is to design, build, and operate a water treatment system to treat a container filled with water contaminated with organic and inorganic matter. The object of the competition is to make economical use of material, while maintaining a high level of treatment using the limited resources.
2. The treatment system must utilize only commonly found, normal household garage materials. All materials must fit totally inside of three, five-gallon buckets with a top firmly attached on each bucket. The buckets may be used as a part of the treatment process.
3. This competition is open to all ASCE student members, both graduate and undergraduate. Teams may contain up to five (5) students. One team from each school may participate.
4. Points will be awarded for efficiency of the system and the ability of the system to produce treated water approaching EPA standards for wastewater effluent as established by the National Pollution Discharge Elimination System (NPDES). In addition, points will be awarded for a technical presentation detailing the design, operation, and capability of the system.
5. On the competition day, the judges may examine all items used and determine they meet the requirements listed herein. If the judges decide that any item does not meet the competition requirements, then 5% of the total points will be deducted for each infraction.
6. The water treatment system must fit onto a standard six-foot long table. One end of the table will be designated as a 1 ft x 1 ft area to be used as a collection area where judges will monitor effluent from the system.
7. Teams will be required to create a processing system that will:
 - a. Receive untreated water at the system inlet
 - b. Treat the sample in the treatment area, and
 - c. Discharge as much effluent as possible, as fast as possible with at least enough effluent to fill 1/2-gallon collection container in the collection area.

8. No water treatment may take place in the collection area. The inlet of the system shall be designed to receive raw the water poured from two five-gallon buckets. The water will be poured manually by a team member and systems that do not allow for proper capture of the water without significant splash will be penalized 10% of the total amount of points. The water will then flow through the treatment system to the collection area where the effluent sample will be collected by the judges in one-gallon collection containers supplied by the judges. 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. Preferential scoring will be given to systems that require minimal intervention for water to flow through the system. Teams are required to discharge a minimum of 1/2 gallon for proper sample collection.
9. Team members will be allowed a maximum of 30 minutes to set up their treatment system. After the 30 minutes has elapsed, team members must exit and stay clear of the treatment area. Two team members may remain at the table. One member will pour the raw water sample into the treatment system, but may make no other manipulations. The other team member may operate and monitor the equipment on the table to manually control any devices or make additions to the process. Twenty (20) minutes will be given to teams to treat the samples after the 30-minute set-up period has elapsed. Any infractions as determined by the judges will be penalized 5% of the total points earned by the team.
10. After the 20-minute treatment period has ended, the effluent produced will be immediately taken by the judges for analysis. Each parameter will be given equal weight although each parameter will require varying efforts to remove. The parameters will be measured according to procedures set forth in the latest edition of Standard Methods. The analysis listed below will be conducted on the treated effluent. Also listed is the standard for that each parameter will be judged against.
 - a. Time to produce 1.0 liter treated effluent sample – Standard: fastest
 - b. Color - Standard: Sample closest to colorless
 - c. Smell- Can judge smell water when bending down next to cleaned water in bucket.
 - d. pH – Standard: closest to neutral
 - e. Turbidity – Standard: Lowest reading
 - f. Ultraviolet Absorbance – Standard: Lowest absorbance

11. The team which serves as the standard will be assigned the 15 points available for that parameter. The remaining teams will be assigned a proportional amount of points relating to the percentage less "clean" than the team with the "cleanest" parameter. For example, if Team A comes has a pH closest to 7.0, they will receive 15 points. If Team B's reading is 25% different from Team A, they will receive 11.25 points.

12. Points will be determined from the following list of items. The maximum amount of points a team may receive is 150 points. The breakdown of the points is as follows:

Amount of time to produce 1 liter of effluent	30 Points Maximum
Color	10 Points Maximum
Odor	10 Points All or Nothing
pH	15 Points Maximum
Turbidity	25 Points Maximum
UV Absorbance	25 Points Maximum
Technical Design	25 Points Maximum
Aesthetics/Workmanship of System Construction	10 Points Maximum
Total	150 Maximum Possible

13. The winner of the competition will be the team with the most accumulated points.

NOTE: 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. Pool cleaning supplies (e.g., chlorine, solvents, bleach) for treating water are not permissible.

Raw Water Characteristics

Each team will be required to treat 10 gallons of water that may be contaminated with (but is not limited to) the following:

chopped leaves	vegetable oil
oyster sauce	grass mulch
small cobble stones (diameter approximately 1-1.5 in)	athletic sock
diced carrots	molasses
rock salt	humus
garlic powder	fine silt
	tuna fish in vegetable oil