

2012 ASCE PACIFIC SOUTH WEST CONFERENCE: Environmental Design Competition

OBJECTIVE:

To design, build, and operate a water treatment system to treat 1 gallon of store-bought drinking water (Such as Sparkletts, Dasani, Aquafina, etc.) to which a contaminant will have been added. The final treatment design should be economical, efficient, and demonstrate knowledge and understanding of the principles behind a drink water treatment system.

PARTICIPANTS:

- Each school may enter one team only.
- Each team consists of a maximum of 5 students.
- Each team member must be a registered participant of the PSWC2012.
- Each team must have at least one underclassman (i.e. someone whom has not taken senior design coursework).
- Each team must have at least one female.
- Participation must be voluntary, not for credit or considered coursework. Professor guidance should not be necessary and should be kept to a minimum.

EVENT DESCRIPTION:

You are a Civil Engineer working for a municipal water agency. As your first task, you are assigned with solving why certain potable water equipment has been malfunctioning more and more frequently. You observe that there exists scaling in the potable water pipes. You must identify what is causing the scaling, which you suspect is causing the malfunctioning, how to stop the scaling from occurring, and what your long-term solution's design will be.

GENERAL RULES:

All teams will bring them with the materials required to set up a treatment system, a poster, and a brochure of their design. A five minute oral presentation is also required.

Design Guidelines

- Design must consist of a pilot testing apparatus made up with environmentally friendly materials that will stand alone during the competition.
- The treatment system must fit within a 5' x 5' maximum square area and 7' height limit.
- Collection space of at least 12"x7"x7" (h x w x l) must be left available in design. This will allow a container of those dimensions to easily slide in or out of the place of collection at any time during treatment.
- Collection containers with volume markings will be provided for scoring the efficiency (water recovery) points.
- Everything used for construction and treatment must be household items (items from pet supply or pool supply stores will not be allowed since these places may carry items too specialized for the average household).
- Battery powered tools are allowed. Electricity will not be available at the competition.
- No water will be provided for priming the treatment systems.

- Disqualification Items:
 - Exceeding size or collection space criteria.
 - Use of fire (Matches, lighters, burners, etc.).
 - Use of consumer water filters (Brita Filter, Pur, fish tank filters, pool filters, etc.), pet supplies or pool supplies.
 - Providing less than 250 mL of treated effluent or not allowing the full gallon to run through the system before providing the sample.
- Hydraulic Challenge – A hydraulic jump must be incorporated into the water treatment system.

Event Proceedings

- A PSWC 2012 volunteer will be assigned to each team
- Systems must be assembled in first 20 minutes of competition. All materials and tools for construction should be supplied by each team
- Presentations will be made after construction and before the contaminated water is run through the water treatment system.
- Contaminated water will be distributed by the PSWC 2012 volunteer to each team and treatment will begin at the same time. Teams will be allowed no more than 2 hours to complete treatment.
- A 250 mL sample must be provided from the effluent batch. The effluent batch must be entirely recovered prior to providing the sample. The PSWC volunteer will certify that the treatment has been completed and take possession of the 250 mL sample.

Presentation, Poster, and Brochure Guidelines

- The presentation and brochure must explain the process of designing and constructing the structure/apparatus.
- Total time of presentation is 5 minutes, which includes 1 minute for questions.
- A poster is required for the presentation.
 - The poster may not exceed 60"x60".
 - The poster and brochures should be in color.
- Four (4) copies of the brochure must be provided at the time of presentations for the judges.
- At a minimum, the poster and brochure must include:
 - A statement of the problem you are solving.
 - The basic design of the structure/apparatus.
 - Cost breakdown of materials used in constructing the structure/apparatus and for treatment. Cost of the poster and brochures do not need to be included.
 - Professional-looking diagrams with explanations of how treatment occurs.
 - Hydraulic calculations/theory for the hydraulic challenge.

SCORING:

The maximum amount of points a team can score is 100 points, with specific scores determined by the judges.

Breakdown of Points

- Presentation (15 points)
- Poster and Brochure (10 points total)
- Color, pH, Conductivity (5 points each)
- Turbidity, Hardness (15 points each)
- Efficiency (10 points)
- Aesthetics of Apparatus (5 points)
- Hydraulic Challenge (5 points)
- Time (10 points)

Calculations for Scoring

- Water Quality Parameters = Ranked point system
 - i.e. Team A score the top turbidity of .5 NTU, Team B has the worst turbidity of 50 NTU. Team A = 15 points for turbidity, Team B = 0 points for turbidity, All other teams will be ranked in order in between. Teams very close together in quality may be given the same number of points since that could be due to human or equipment error but this will be left up to the judges to determine.
- Efficiency = (Water Recovered/1 gallon) * 10 points
- Aesthetics of Apparatus:
 - 5 points for professional-looking system (proper materials, clean, easy to understand and run)
 - 3 points for average-looking system (some proper materials, more difficult to use, clean)
 - 1 points for working system (does not fall apart, has not been run previously) May be difficult to use, sloppy-looking and made from inappropriate materials for long-term use)
 - 0 points for system that does not meet any of the above criteria
- Hydraulic Challenge:
 - 5 points for accomplishing the jump with supporting technical information in brochure or poster
 - 3 points for accomplishing the jump but without an explanation
 - 0 points for not accomplishing the jump.
- Time - Finishing water treatment (As determined by when efficiency is recorded and a sample provided) within:
 - 30 minutes = 10 points
 - 45 minutes = 8 points
 - 1 hour = 6 points
 - 1.5 hours = 4 points
 - 2 hours = 2 points
 - Over 2 hours = 0 points