

Water Filtration Competition



THE UNIVERSITY OF
MEMPHIS®

Herff College of Engineering

Objective

A goal of civil engineering professionals is to **provide clean water** and other sustainable infrastructure development to developing nations. Many water filters are surprisingly effective and easy to build from materials that are readily available.

The objective of this competition is to design a water filter in a soda bottle that lets as much water through as possible, while cleaning that water as much as possible.

Parameters

Your water filter will be judged on two categories: **flow rate** and color (**turbidity**). On the day of the competition, dirty water will be run through the filter for 5 minutes. Then, the filtered water (effluent) will be measured for volume and turbidity.

Competition rounds will start every 15 minutes, and up to three teams can compete in each round.

Scoring

Your score is based on two categories: **flow** and **turbidity**. High flow is best, and low turbidity is best. Your flowrate score is out of a possible 40 points, and your turbidity score is out of a possible 60 points. The paper is worth up to 20 points. So, the calculation for your final score is:

$$\text{Final Score} = \left(40 \times \frac{\text{Your Flow}}{\text{Best Flow}}\right) + \left(60 \times \frac{\text{Best Turbidity}}{\text{Your Turbidity}}\right) + \text{Paper Score}$$

HOWEVER: Any group whose filter effluent has turbidity greater than 100 NTU will be disqualified. Any group whose filter produces less than 3.00 lbs of water will be disqualified.

Materials

To make your filter, cut the bottom off of a clear, 2-liter soda bottle. Using a rubber band, attach one coffee filter over the top of the bottle. Cut the filter to fit neatly around the mouth and neck of the bottle. Turn it over and fill it no more than six inches deep with your filter materials. The total height of the bottle should be 10 inches \pm ¼ inch. The depth of filter materials should be six inches or less; and any filter with more than six inches of filter material will be disqualified (see diagram below).

The filter materials you may use are:

- Cotton balls
- Coffee grounds
- Potting soil
- Playground sand
- Gravel and rocks
- Charcoal
- Wood chips
- Oatmeal
- Sugar
- Grass clippings

Reporting

Submit a short paper (about a page or two) with your filter describing the process you used to make the filter. Include a table or diagram showing which materials you chose and how much of each material you used. Then describe your rationale for the choices you made. You can include images of the team working on the filter, the finished product, or anything else you feel helps to show your process. If you do any design testing, include information about your test process and results, as well as any lessons learned.

Your paper should also include a heading with:

- Your school
- Your grade
- Your teacher's name
- Contact information, so your paper can be returned to you with comments

Filter Setup

Cut the bottom off the bottle,
Leaving it 10 inches tall.

Fill bottle no more than 6"
deep with your filter materials

Attach one coffee filter
Here
With one rubber band

